IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

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DIESEL PROGRESS for September, 1951, Volume XVII, Number 9. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 816 North La Cienega Boulevard, Los Angeles 46, California. Rex W. Wadman, President. Subscription rate: $5 per year, single copy 50c. Acceptance under 34.64, P. L. & R., authorized.

FUEL...

Whether you're using Diesel, gas or dual-fuel engines, you'll get better compression and combustion—with resulting lower fuel consumption—by lubricating with *Texaco Ursa Oil*. That's because rings stay free, ports stay clear, valves function properly.

Texaco Ursa Oil gives you these benefits because its high oxidation-resistance keeps engines clean. Harmful sludge and carbon won't build up. Wear is kept to the very minimum. Bearings are protected against corrosion. Parts last longer; maintenance costs are less.

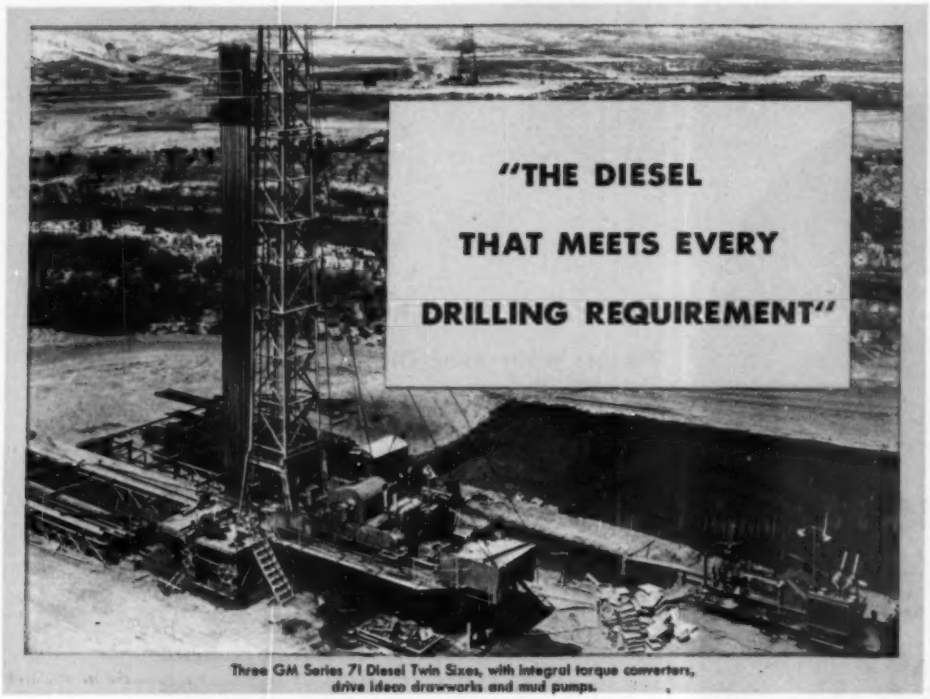
You can get a *Texaco Ursa Oil* that's exactly right for your engines. There is a complete line, approved by leading engine builders, and they're America's No. 1 favorites. For example—

> **More stationary Diesel h.p. and more railroad Diesel locomotives in the U. S. are lubricated with Texaco than with any other brand.**

Bring *your* costs down with Texaco. A Texaco Lubrication Engineer will gladly help you. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd St., New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES



Three GM Series 71 Diesel Twin Sizes, with integral torque converters, drive Ideco drawworks and mud pumps.

OIL well drilling contractor M. H. Stansbury, of Bakersfield, California (who has been drilling in California fields since 1935), writes as follows:

> "The GM Diesel engine is of the right size, sufficient horsepower and all-around characteristics to meet the severe requirements of oil well drilling. Also the immediate availability of repair parts and service is highly important to this business."

Two-cycle operation, with power at every piston downstroke, gives GM Diesel engines more power in fewer units that weigh less and take up less space. GM's exclusive system of direct fuel injection—with easily replaceable unit injectors—insures cleaner, more accurately controlled combustion and eliminates troublesome high-pressure fuel lines. The same basic design is used in all Series 71 engines from 2-cylinder single to 24-cylinder multiple units. This assures high parts interchangeability and low-cost maintenance. And these engines are backed by General Motors' world-wide service facilities.

Before you buy new equipment or repower old, it will pay you to get all the facts about GM Series 71 and 6-110 Diesel engines and the new GM Diesel Torque Converter units. *Write, wire or phone for details.*

DETROIT DIESEL ENGINE DIVISION

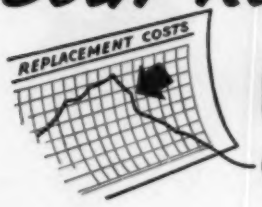
SINGLE ENGINES...Up to 275 H.P. **DETROIT 28, MICHIGAN** MULTIPLE UNITS...Up to 800 H.P.

GENERAL MOTORS

DIESEL BRAWN WITHOUT THE BULK

GM GENERAL MOTORS DIESEL POWER

Beat Replacement Costs...



GUN IRON CAST PARTS

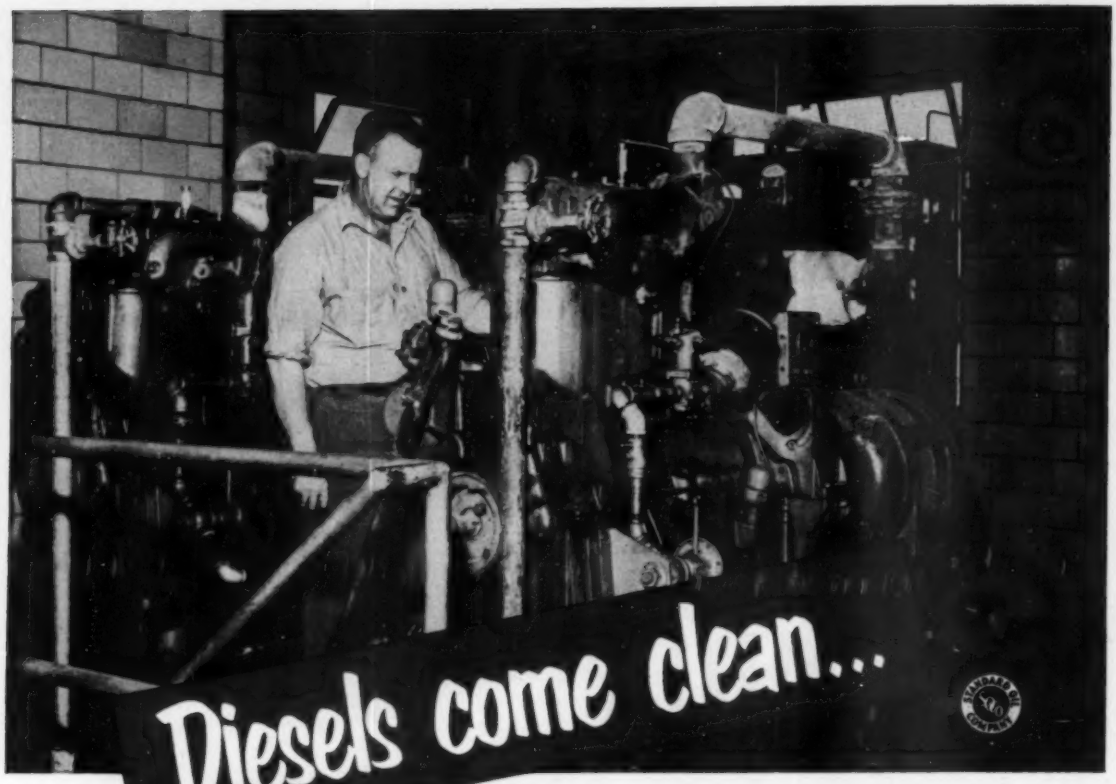
Gun Iron is a super-refined iron, highly resistant to frictional wear, high heat, pressure, and erosion. It combines outstandingly those engineering properties that spell long, economical service.

You can rely on diesel parts cast of Gun Iron to serve you better longer, to provide high-measure protection against costly operating failures. That means more than worthwhile savings in replacements. It means longer periods of trouble-free, economical operation, one of the keys to more profitable operation. Today, in the face of equipment shortages, high maintenance costs, long economical service takes on added importance.

For the most from your cast parts—to beat replacement costs, investigate economical Gun Iron. Our engineers stand ready to assist you in determining its value in your applications. **HUNT-SPILLER MANUFACTURING CORP., 387 Dorchester Ave., Boston 27, Mass.**

Canadian Representatives: Jos. Robb & Co., Ltd., 4050 Namur St., Montreal 16, P.Q.; *Export Agents:* International Rwy. Supply Co., 30 Church St., N.Y. 7, N.Y.

***HERE IS A PRACTICAL GUIDE** for the user of iron and steel castings . . . 24 pages of technical data on many types of metals and alloys. Write for your free copy.*



more time between overhauls

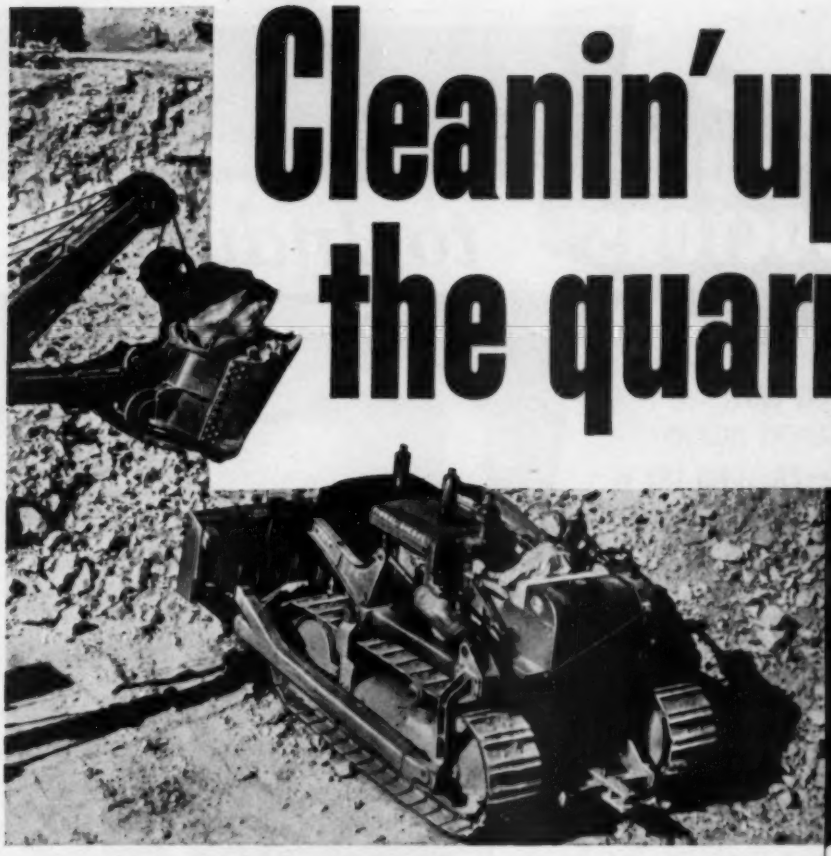
These two 50-HP diesel engines, serving in a midwest sewage disposal plant and utilizing sewage gas as fuel, had to be shut down on an average of every three months to have stuck rings and valves freed and crankcases cleaned of sludge.

Then a Standard Oil lubrication specialist recommended STANDARD HD Oil. Sticking of rings and valves has been eliminated. The engines have stayed clean, operating for as long as two years between overhauls. Operators report a 20% reduction of oil consumption.

This plant's success in lowering maintenance costs is typical of the results gained by STANDARD HD users wherever operating loads are severe and/or fuel quality is adverse. To apply the benefits of STANDARD HD Oil in your own diesel operation, call for the services of your local Standard Oil lubrication specialist. Contact your Standard Oil Company office or write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD HD
TRADE MARK
OIL

STANDARD OIL COMPANY STANDARD *(Indiana)*



Cleanin' up the quarry

INTERNATIONAL

Arnold Graf's International TD-18 keeps production high, costs low in Molino, Missouri, quarry

Arnold Graf, Molino, Missouri, bought an International TD-18 crawler as production insurance for his limestone quarry two years ago. Here's what has happened since:

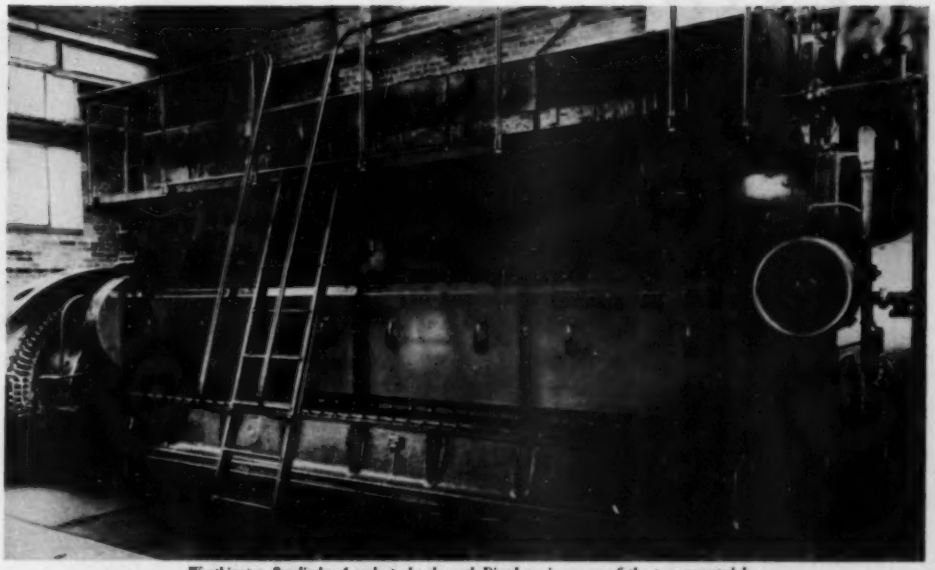
With the TD-18 doing everything from dozing 15-foot overburden to feeding the shovel and cleaning up the quarry floor, production zoomed to 700 tons a day. The crawler's 1,600-hour work record shows no downtime and no repairs.

POWER THAT PAYS

"We recommend the TD-18" says Mr. Graf, "to anyone with a tough piece of work to do. It has given us excellent service while doing the dozens of quarry jobs only this powerful crawler does best."

International crawlers defy the grit in your pit or quarry and give you greater production per power dollar. Ask your International Industrial Distributor for all the facts, including his after-sale policy. Then go ahead with International "Power that Pays!"

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS



Worthington 8-cylinder 4-cycle turbo-charged Diesel engine—one of the two operated by Elko-Lamoille Power Company. This 1000 Kw-rated engine was installed on the same foundation originally built for an engine with 250-Kw rating.

Lesson in Cost Reduction

FROM THE MIDDLE OF THE DESERT

If you've never heard of Elko, you'll find this story interesting.

Elko is the seat of a county in Nevada that, all by itself, is larger than Massachusetts, Connecticut and Rhode Island together, with Delaware thrown in. Since pioneer days, it has been a transportation and trading center.

Elko's present power plant set-up, which includes two four-cycle turbo-charged Worthington Diesel engines connected to 1000-Kw generators, contrasts with the single 50-hp steam engine purchased second-hand in 1896 from a nearby silver mine.

Cost of power has never been more reasonable. Ever since 1940 when fuel oil cost this plant less than half what it does now, power rates have *gone down*—having been reduced twice during the period. Today, 87% of the power is produced by the two Worthington units, and in 1950 the plant averaged 13.3 Kw-hrs per gallon of fuel.

Lubricating oil consumption is low, too—well below the estimated 4,000 rated horsepower hours per gallon.

Want more evidence that there's *more worth in Worthington?* Write Worthington Pump and Machinery Corporation, Engine Division, Buffalo, N. Y.

WORTHINGTON

8.1.51

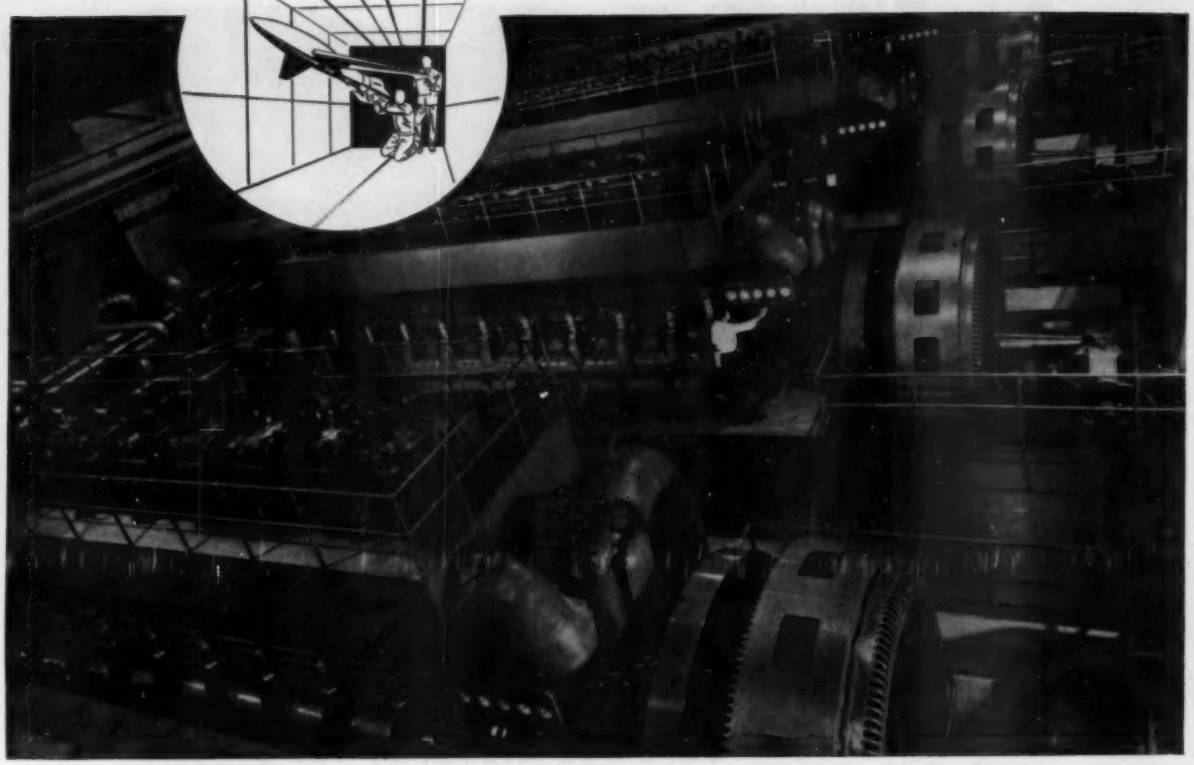
ECONOMICAL
CONTINUOUS POWER

Diesel Engines, 150 to 3640 hp
Gas Engines, 190 to 2880 hp
Dual Fuel Engines, 345 to 2640 hp

WORTHINGTON-BUILT AUXILIARIES




At the Langley Aeronautical Laboratory electric power is supplied by these 6,600-volt, 2,500-kw, a-c Westinghouse Generators driven by Nordberg Diesel Engines.



Electric Power...Made to Order

Many contributions to America's air supremacy have been developed in the Langley Aeronautical Laboratory of the National Advisory Committee for Aeronautics. Supplementary power at peak loads to operate the large wind tunnels and stand-by power to serve the general research needs is supplied by the engine-generator units shown above.

The specifications for this power plant were wide in scope in 1940—today the specifications for new mammoth wind tunnels are considerably greater. Originally this plant was designed to ease the Laboratory's peak-load demands on the utility system. The engine-generator units had to be capable of starting and picking up large and intermittent loads on little or no notice and be suitable for frequent starting and stopping during any 24-hour period. Also, it was necessary for the plant to carry vital operating loads of the adjacent air base and feed power back into the local public utility system in any emergency.

Westinghouse engineers went to work on the generator problem . . . produced four 6,600-volt, 2,500-kw, a-c generators to handle the job. These Westinghouse Generators have been serving the Langley Aeronautical Laboratory for the past ten years.

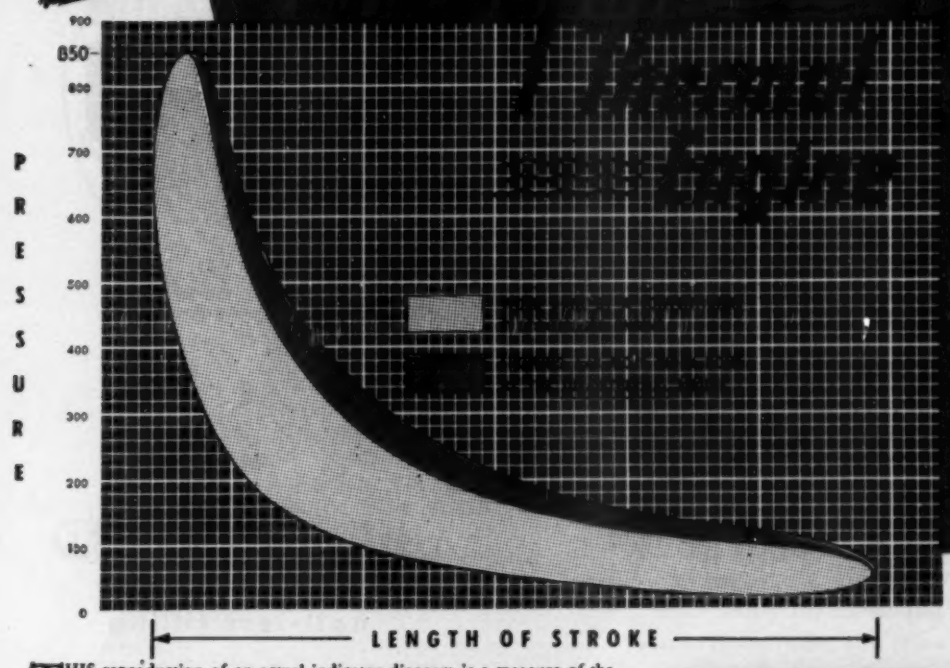
Consult your nearby Westinghouse Office for the services of a Power Apparatus Specialist. He will help you select and apply the right generator for your job. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-10358

You can be sure of Westinghouse

AC GENERATORS

Here it is... ONE-THIRD MORE POWER



THIS reproduction of an actual indicator diagram is a measure of the average pressures within the cylinders of the *SUPAIRTHERMAL* Engine* and a conventional turbocharged engine. The darker area shows the amount of work being done by each piston in the conventional engine. The *solid red* area shows the *increase in the amount of work* done by each piston in the Nordberg *SUPAIRTHERMAL* Engine—*resulting in an increase of one-third in horsepower without increasing the maximum combustion pressure or the internal temperatures.*

Here, then, is actual proof that the Nordberg *SUPAIRTHERMAL* Engine *is* the outstanding engine of the Diesel field . . . delivering one-third more horsepower in the same space as a conventional turbocharged engine.

The *SUPAIRTHERMAL* Engine is available in a full range of 4-cycle types for fuel oil, Duafuel, or spark ignition gas operation, in sizes from 425 to 3200 B.H.P. Write for further information on the *SUPAIRTHERMAL* Engine, outlining your power requirements. *(Patents Pending).

NET RESULTS:

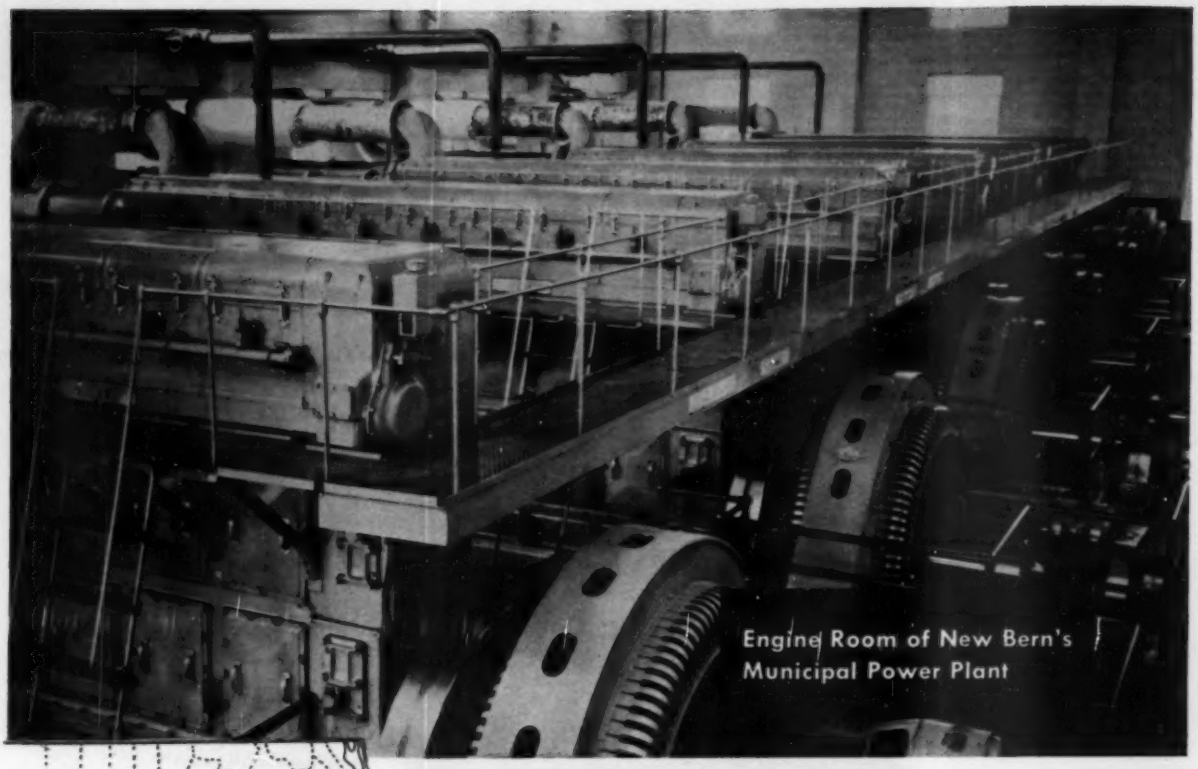
• 1/3 MORE HORSEPOWER IN SAME FLOOR SPACE • MORE HORSEPOWER PER GALLON OF FUEL • MORE HORSEPOWER HOURS PER GALLON OF LUBE OIL • INCREASED THERMAL EFFICIENCY • LESS HEAT LOSS TO WATER JACKETS • LESS WEIGHT PER HORSEPOWER • LOWER INSTALLATION – OPERATING – AND MAINTENANCE COSTS.

NORDBERG MFG. CO., Milwaukee 7, Wis.

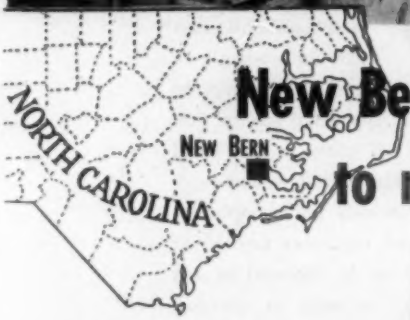
P-9M251

NORDBERG

DIESEL ENGINES



Engine Room of New Bern's Municipal Power Plant



New Bern Installs SIXTH Superior Diesel to meet increased power demand

New Bern's growing population made so many demands on the municipal power supply that city officials had to increase the plant's capacity by 20%, less than three years after it was originally placed in operation.

The decision to add another Superior Diesel was a logical one because the service records of the original five Superiors had confirmed the promised economies in fuel cost and maintenance expense. The sixth unit is an 8-cylinder supercharged engine developing 1440 HP and directly coupled to a 1000 KW generator.

In the performance records for power generation throughout the U.S.A., there's conclusive proof of the economy and dependability you can expect from an investment in Superior or Atlas Diesels.

Superior ENGINES

ATLAS Imperial DIESEL ENGINES

THE NATIONAL SUPPLY COMPANY

ENGINE DIVISION

Plant and General Offices: Springfield, Ohio

DIESEL ENGINES • DUAL FUEL ENGINES • GAS ENGINES

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT RPM Delo R.R. Oil

UNIT Locomotive diesel engines

SERVICE Freight and passenger

OPERATION Local and transcontinental

MAINTENANCE Progressive

One million miles of service from engine parts!

LUBRICATED WITH RPM DELO R.R. OIL, many diesel engines in the locomotives of U.S. railroads have been in service for long periods without complete overhaul! Many of the liners, pistons, bushings and other parts in these engines have now been in use for hundreds of thousands of miles. Progressive maintenance inspections indicate that RPM DELO R.R. Oil will keep the parts in service for at least one million miles, the general overhaul period set by some of the railroads.

RPM DELO R.R. Oil keeps parts clean and free of wear-causing lacquer and gum deposits and is not corrosive to engine metals of any kind.

IN OVERLAND MOUNTAINOUS FREIGHT SERVICE for nearly 500,000 miles, this liner, lubricated with RPM DELO R.R. Oil has less than 0.006 inch wear and taper is so minor that it is barely measurable.

How RPM DELO R.R. Oil prevents wear, corrosion, oxidation

A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

THIS PISTON AND CONNECTING ROD have been in service for more than four years. After picture was taken it was put back in the engine for further use. Note the excellent condition of the rings and bearing. All the rings are free, oil holes open and there are no troublesome deposits in any ring grooves.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any one of the companies listed below.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

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225 Bush Street • San Francisco 20, California

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P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas

MADISON-KIPP *Automatic* LUBRICATION

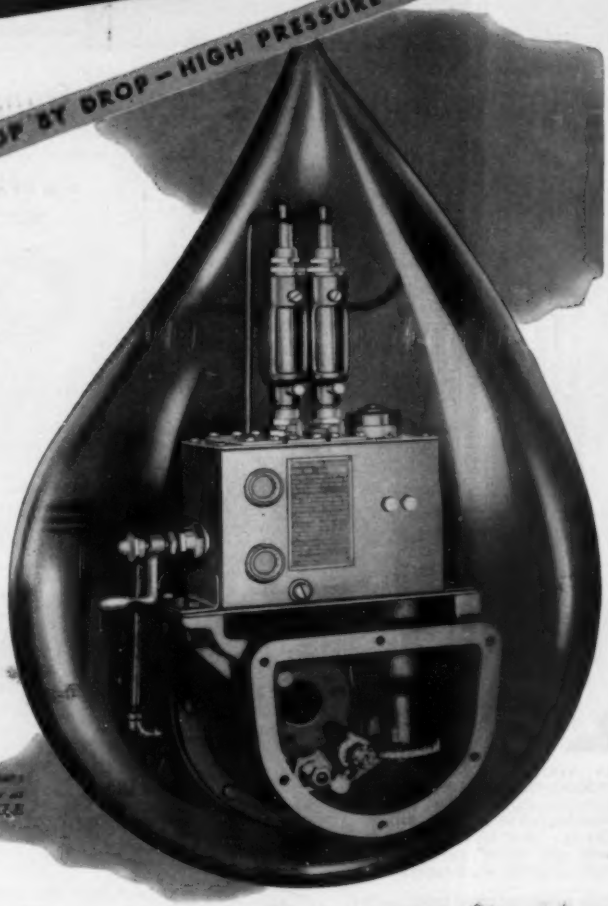
DRIVING SPEED REGULATED TO MACHINE SPEED

MEASURED FEED — DROP BY DROP — HIGH PRESSURE DELIVERY

HERE is a close-up illustration of an actual application of a Bottom Rotary Drive Model SVH Madison-Kipp Lubricator. The operator's responsibility is reduced to a minimum. The machine manufacturer has given his customer a life-time plus value.

Madison-Kipp is the most dependable method of lubrication ever developed and there are models to fit almost every original equipment requirement with automatic drives to fit every application.

Engineering details are, of course, yours for the asking.



Madison-Kipp Bottom Rotary Drive Model SVH Lubricator as applied to Ingersoll-Rand XF-8 Compressor.

MADISON-KIPP CORPORATION

215 WAUBESA STREET, MADISON 10, WIS., U.S.A.

ANCIENS ATELIERS GASQUY, 31 Rue du Marais, Brussels, Belgium, sole agents for Belgium, Holland, France, and Switzerland.

WM. COULTHARD & CO. Ltd., Carlisle, England, sole agents for England, most European countries, India, Australia, and New Zealand.

- *Skilled in* DIE CASTING *Mechanics*
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International Harvester Company Model UD24 Portable Diesel Units . . . Power-Protected by Purolator

It aint smog, mister...

No, IT ISN'T. *It's clouds of abrasive rock particles* from crushers and conveyors. Sudden death for unprotected engines!

Situations like this are good reason why so many manufacturers and operators rely on the Purolator* Micronic Oil Filter.

Purolator traps abrasive particles as small as microns (.000039"); traps more dirt faster—because it has a revolutionary accordion-pleated refill providing a filtering area up to 10 times greater than old-style filters. In addition, it won't warp, distort, or disintegrate.

For lube oil, the Purolator Micronic* assures less wear on hard-working bearings and other vital parts.

For fuel oil, it provides the complete filtration so essential for close tolerance injector orifices.

Whatever your filtering problem, let our engineering staff show you how to solve it! *Reg. U.S. Pat. Off.

Protect your Power with...

PUROLATOR
MICRONIC OIL FILTER
"FIRST IN THE FIELD OF FILTERING"

PUROLATOR PRODUCTS, INC. • RAHWAY, NEW JERSEY and TORONTO, ONTARIO, CANADA
FACTORY BRANCH OFFICES: CHICAGO, DETROIT, LOS ANGELES

complete

laboratory control

to assure efficient, economical operation

Ashland

special DIESEL

fuels and lubricants

Ashland's modern refinery methods include a complete chain of laboratory checks and controls to maintain a constant balance of product. Once you have selected the correct type of diesel fuel best suited to your specific engine and application, you can depend on Ashland to keep you supplied with absolutely uniform products.

Complete control in the refinery permits Ashland to offer a number of types of diesel fuels, one of which will meet or exceed the rigid specifications required by your engine manufacturer. Stability, cleanliness, fluidity and ignition performance have been improved, along with better lubrication of fuel pumps and injectors, greater power output and a reduction in exhaust smoke.

Specify Ashland Diesel Fuels and lubricants and enjoy the efficient, trouble-free operation that modern, controlled refining can bring you. Contact our nearest office or write for an experienced engineer to call and discuss your specific requirements.

...complete line of lubricants for diesel equipment

ASHLAND OIL & REFINING COMPANY

ASHLAND, KENTUCKY

SUPPLY TERMINALS: Ashland, Ky. — Buffalo, N. Y. — Canton, O. — Cincinnati, O. — Cleveland, O. — Erie, Pa. — Evansville, Ind. Findlay, O. — Follansbee, W. Va. — Freedom, Pa. — Kenova, W. Va. — Kobuta, Pa. — Louisville, Ky. — Marietta, O. — Nashville, Tenn. — Niles, O. — Paducah, Ky. — Pittsburgh, Pa. — St. Elmo, Ill. — St. Louis, Mo. — Toledo, O.

Building the 2nd ten thousand on the experience of the 1st

In June of this year Electro-Motive Division celebrated the completion of the ten thousandth General Motors Diesel locomotive unit.

This record of production is a landmark in national progress because of the improvements in transportation this motive power has made possible.

But still more important, the skills, the facilities and the experience gained in producing ten thousand Diesel locomotive units stand for a promise of even greater things to come.

For we view this outstanding record, made with the cooperation of American railroads, as a new base line of our responsibility to the men charged with continued improvement of railroad transportation.

We believe that the confidence placed in us by the railroads, through their purchases of General Motors locomotives, imposes upon us the responsibility to keep these skills, experience and facilities at work in constant improvement of locomotive design and manufacturing techniques.

As we enter upon production of the Second Ten Thousand, we intend to build upon the experience of the past with developments, refinements and improvements which should add even more efficiencies and economies to one of the most vital and fascinating industries in the world.

ELECTRO-MOTIVE DIVISION

GENERAL MOTORS GENERAL MOTORS LOCOMOTIVES LA GRANGE, ILL.

Home of the Diesel Locomotive

In Canada: GENERAL MOTORS DIESEL, LTD. London, Ontario

VOLUME SIXTEEN

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VOLUME SIXTEEN

A MUST for design and operating Engineers! Indispensable for Buyers! Invaluable to Instructors and Students!

IN NO OTHER BOOK can be found such complete and detailed information on diesel engines and accessories. Rewritten in its entirety while being brought up-to-date, great attention has been given to make Diesel Engine Catalog an easy-to-read book. Its comprehensive classification and indexing all contribute to making any item easy-to-find.

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MAKE SURE THE INFORMATION AT HAND IS ACCURATE AND UP-TO-DATE!

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Enter my order today for a copy of the Diesel Engine Catalog, Volume Sixteen, Edited by Rex W. Wadman, for which I enclose $10.00. (Copies may be ordered in Sterling areas by remitting £4:0:0 to E. H. Doddrell, 142 St. Paul's Corner, Ludgate Hill, London, E.C.4.)

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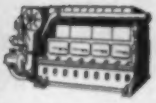
ADDRESS.....

CITY..... ZONE..... STATE.....
(Please Print)

Diesel Engine Staying Power

Upped



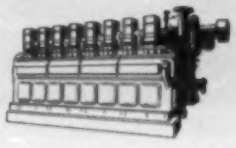
BY THESE 4 STEPS

1st step: Examine Cities Service lubricants for out-and-out quality through your purchasing experts or test facilities . . . or from service records established by critical users.

2nd step: Look into the completeness of the Cities Service line as an aid to simplified ordering and prompt, steady supply . . . backed by the extensive facilities and intensive cooperation to keep you out of any lubrication "jam."

3rd step: Review today's most effective Diesel lubrication practices by consulting that fully informed specialist, the Cities Service Lubrication Engineer.

4th step: Ask for facts about the high character of the Cities Service line and the practical technical assistance now upping Diesel staying power for many of industry's "hardest drivers." Phone or write CITIES SERVICE OIL COMPANY, Room 108, Sixty Wall Tower, New York City 5.



CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

. . . WE HAVE STANDARDIZED ON GM DIESEL ENGINES FROM STEWART & STEVENSON"

Report Loyd Richardson and R. C. Thwing

The decision by Mr. Richardson and Mr. Thwing to standardize on GM Diesel Engines is based on years of experience in general marine contracting work . . . plus the fact that GM Diesel Engines are compact, easy to maintain, and "outperform any other engine in their horsepower range."

The LWR 16 . . . newest boat in the Richardson fleet . . . is a sister ship to the Kabibonoka, one of the first tugs on the Texas Gulf Coast to be powered by a GM Marine Diesel Engine. Other GM powered Richardson tugs are the Jimmie, Loyd W, Dredge, LWR 13, LWR 14, LWR 16 and the Capt. Ira.

Designed by Mr. Richardson and built by Burton Shipbuilding in Port Arthur, the LWR 16 is built to stand the test of heavy duty Gulf Coast towing. Its GM Model 6-110 engine develops 250 maximum horsepower. In operation, the LWR 16 is just as dependable as the GM engine that powers it, and the Stewart & Stevenson service organization that stands behind the engine.

This combination . . . the most dependable engines in the field backed by the best service organization in the world . . . is your assurance that when you deal with Stewart & Stevenson Services you get the best! Yes, you have the added satisfaction of knowing that when you buy from Stewart & Stevenson Services your engines are guaranteed to do the job they are recommended to do. The integrity and reputation of Stewart & Stevenson for fair dealing is recognized the world over. Contact your nearest Stewart & Stevenson representative today for complete details on your marine power requirements.

STEWART & STEVENSON SERVICES, Inc.

Main Office and Plant: 4516 Harrisburg Blvd., Houston 11, Texas. Phone WOodcrest 9691

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Representatives: San Antonio, Waco, Longview, Brownsville, Breckenridge.

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Anytime Anywhere

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FRONT COVER ILLUSTRATION

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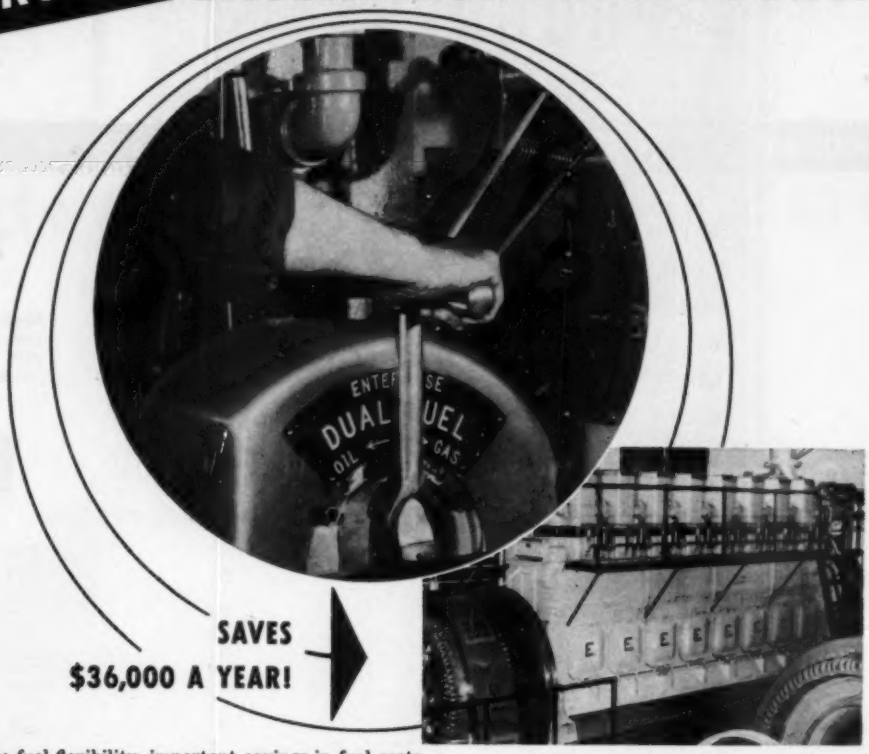

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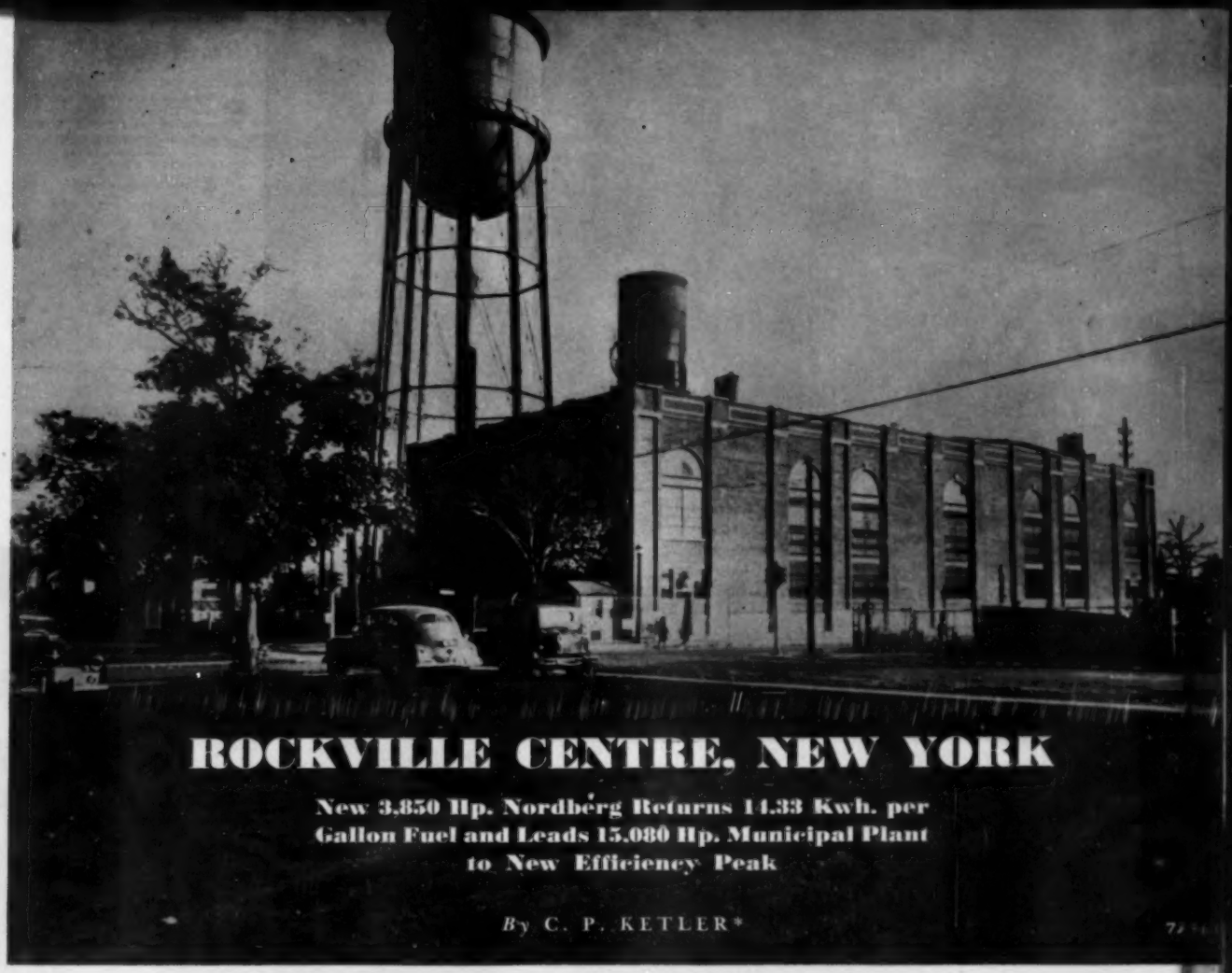


ROCKVILLE CENTRE, NEW YORK

New 3,850 Hp. Nordberg Returns 14.33 Kwh. per Gallon Fuel and Leads 15,080 Hp. Municipal Plant to New Efficiency Peak

By C. P. KETLER*

Because of streets and the adjoining railroad tracks, it would be difficult and expensive to extend the Rockville Centre plant but fortunately the big Nordberg diesels fit easily into the space occupied by much smaller old engines. In background can be seen the top of the old standpipe now used as an induced draft cooling tower.

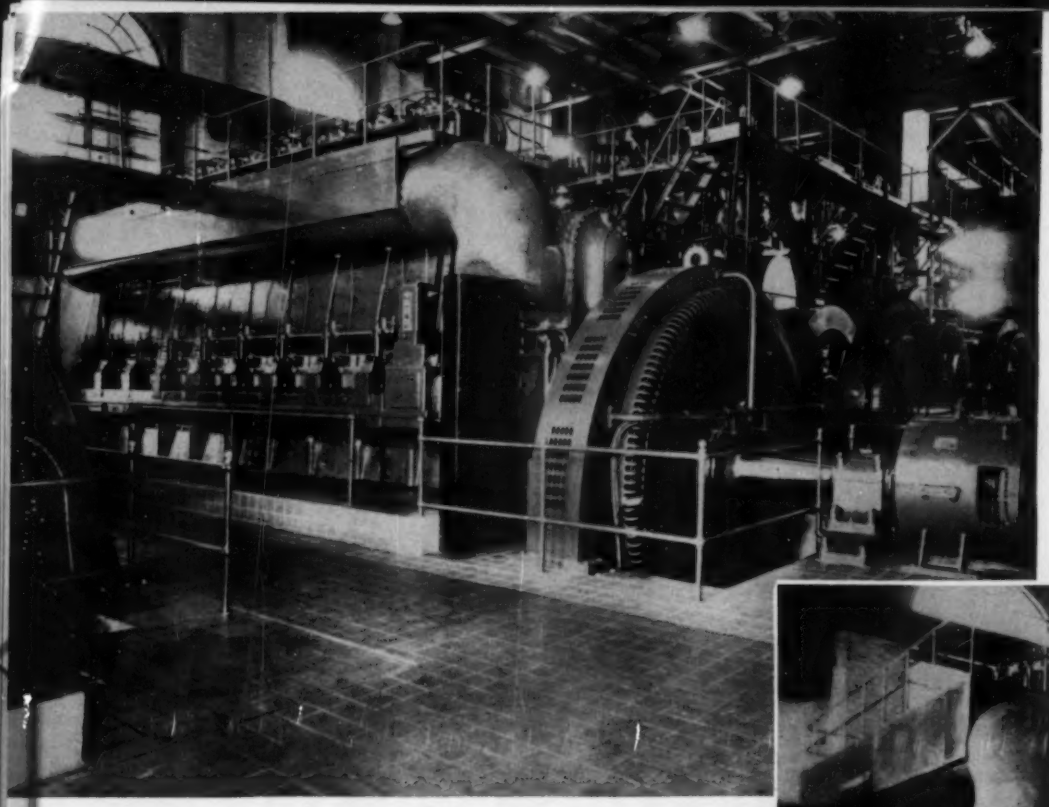
THE Rockville Centre municipal power plant long has been notable for the efficiency of its diesel operation. Today, this 15,080 hp. plant is getting more power out of a gallon of fuel than ever before in its history. A major factor in this achievement is the performance of a new 3,850 hp. Nordberg diesel which went into service on Dec. 19, 1950. By Feb. 28, 1951, the close of the 1950-51 fiscal year, the new engine had run 909 hours, generated 1,622,000 kwh. and consumed 113,213 gal. of fuel, an average of 14.33 kwh. per gal. This was accomplished at an average load of just 65.6 per cent of capacity.

But new engines are only half the story. Rockville Centre engineers know how to get the best performance from their older prime movers, maintaining and even improving their efficiency down through the years. For example, the 2,865 hp. McIntosh & Seymour diesel installed in Feb. 1933, generated 2,287,600 kwh. in its first full year of operation at an average of 12.5 kwh. per gal. of fuel. In 1950-51, the same engine produced 7,529,200 kwh. for an average of 13.05 kwh. per gal. It is interesting to watch the concurrent growth in size and operating efficiency of this pioneer plant. This residential community on the south shore of Long Island started power production back in 1898 with a small steam plant. The modern power story starts in 1928 when the obsolete steam plant was replaced with three four-cycle, air-injection McIntosh & Seymour diesels, one rated at 825 hp. and two at 1,250 hp. A third 1,250 hp. unit was added in 1930, a 2,865 hp. diesel of the same make in 1933 and another 2,865 hp. unit in 1937.

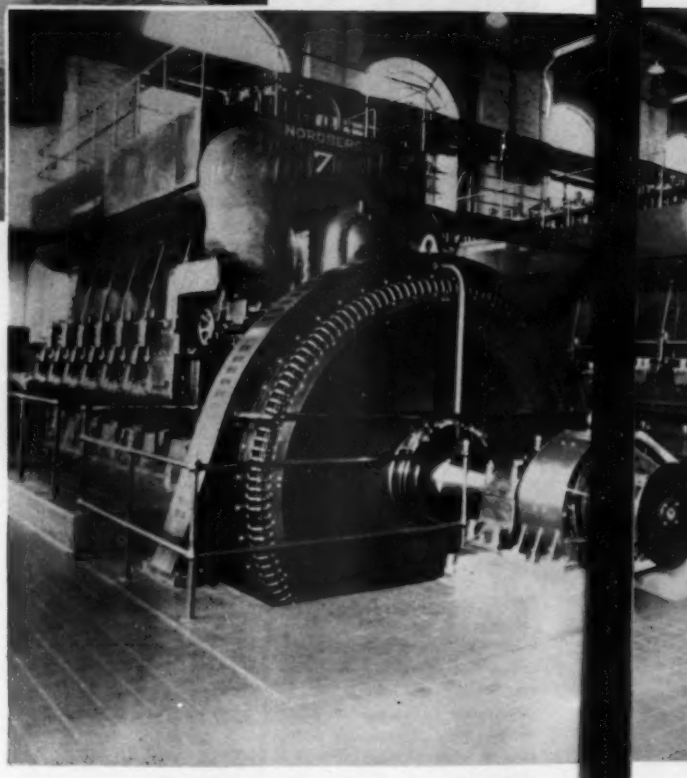
The next significant change came on Aug. 27, 1942, when the village put in service a 3,000 hp. two-cycle, mechanical-injection Nordberg diesel engine in place of the 825 hp. unit. In the 8½ years from this installation date to the close of the 1950-51 fiscal year, the big engine produced 68,315,900 kwh. Fuel consumption was 4,980,616 gal., an average of 13.71 kwh. per gal. of fuel. With this engine in operation, the plant topped 13 kwh. per gal. for seven consecutive years, reaching a peak of 13.29. Table I gives the entire 23-year record of kilowatt-hours generated and fuel consumed. This municipal diesel plant was built up from 2,579,100 kwh. in 1928-29 to 29,532,400 kwh. in 1950-51. In all, the diesels have generated the impressive total of 313,087,900 kwh.

Rockville Centre, like other communities in the New York suburban area, has been growing rapidly in population. In 1950-51, the number of residential accounts rose to 6,438, commercial accounts rose to 1,053. An equally important factor in load development has been the increase in consumption per account. Thus, an average residential consumer used 926 kwh. in 1935-36, increased his purchase to 1,455 kwh. in 1945-46, and went up to 2,061 kwh. in 1950-51. Similarly, the average commercial consumer used 3,360 kwh. in 1935-36,

*Commissioner of Public Works, Rockville Centre, Long Island, N. Y.



This new 3850 hp. Nordberg diesel brings Rockville Centre plant capacity to 15,080 hp. The engine drives a 3400 kva. Westinghouse generator with direct-connected exciter.



jumped to 5,258 kwh. in 1945-46, and zoomed all the way to 8,900 kwh. in 1950-51. The increase in commercial consumption can be attributed to better lighting and to air conditioning. The residential gains were caused by more lighting, electrical appliances such as electric stoves and deep freeze cabinets, and in considerable measure to television. It is estimated that television alone has raised the electric department's income $70,000.00 a year.

All this increased use of electricity has pushed peak loads skyward. Picking a few years at random, peak load was 2,140 kw. in 1929, rose to 3,440 kw. in 1935, jumped to 5,125 kw. in 1945, and climbed way up to 8,300 kw. in 1950. From 1948 on, the load exceeded the plant's firm capacity. That is to say, the plant could not carry its peak without its biggest engine. In fact, the load came very near actual plant capacity with *all* engines in operation. Obviously plant expansion was essential and Rockville Centre officials moved quickly to secure another engine in time to help carry the December 1950 peak. Official recommendations were made to the Board of Trustees on January 27, 1949. The engine was in operation on Dec. 19, 1950.

It was natural that Rockville Centre should choose a diesel of the same type as the 3,000 hp. engine which had proven its economy over an 8-year period. Consequently, the new Nordberg engine is identical in its essentials, except that it has nine cylinders instead of seven. It is a two-cycle, mechanical-injection diesel engine with 21½ in. bore and 31 in. stroke, developing 3,850 hp. at a moderate 225 rpm. Like the other units in the plant, it is a cross-head type engine. In choosing this new prime mover, the village held to its long-established preference for heavy-duty, slow-speed engines. Though considerably faster than the 164 rpm. diesel it replaced, the new unit's 225 rpm. is still moderate by modern standards. Striking evidence of the advance in diesel design is the fact that the 3,850 hp. engine fit easily into the space formerly occupied by a 1,250 hp. unit.

Fuel economy has been a crucial matter for Rockville Centre during the post-war inflationary pe-

Most efficient engines in the Rockville Centre plant are the 3000 hp. Nordberg (No. 7) which averaged 13.71 kwh. per gal of fuel in 8½ years, and the new 3850 hp. Nordberg which produced 14.33 kwh. per gal. in its first 909 hours.

riod. Officials of the municipal utility recognized a dual responsibility: first, to keep electricity rates down; second, to continue the contributions of cash and services that serve to reduce village taxes. Let us say quickly that both these objectives have been obtained. Rates charged the residential consumer have not been raised and remain lower than any private utility rates in the county. Contributions of cash and services to the village exceed $100,000.00 a year. In the past five years, contributions have totaled more than $616,000.00, and of this big sum $260,000.00 was in cash.

This financial success has been achieved in spite of rising fuel costs and has been possible only because Rockville Centre engineers have been able to get more power per gallon of fuel and because the engines in use are capable of burning relatively low-cost oil. The village paid 5 cents a gallon in 1942 and 8½ cents in 1951. Both the air-injection and the newer mechanical-injection engines burn a No. 4 fuel oil with the following specifications:

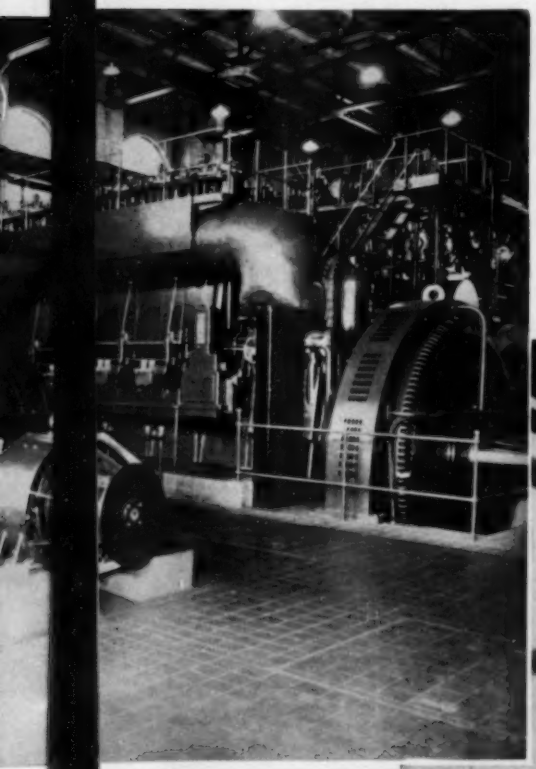
Btu per lb.	18,995
Conradson carbon	0.51%
Ash	0.002%
Sulfur	0.16%
Gravity API at 60°F.	21.7
Viscosity SSU at 100°F.	68.5
Hard asphalt	0.09%
Water & Sediment	0.05%
Flash point	210°F.
Pour point	−70°F.
Diesel Index No.	27.8
Aniline point	128°F.

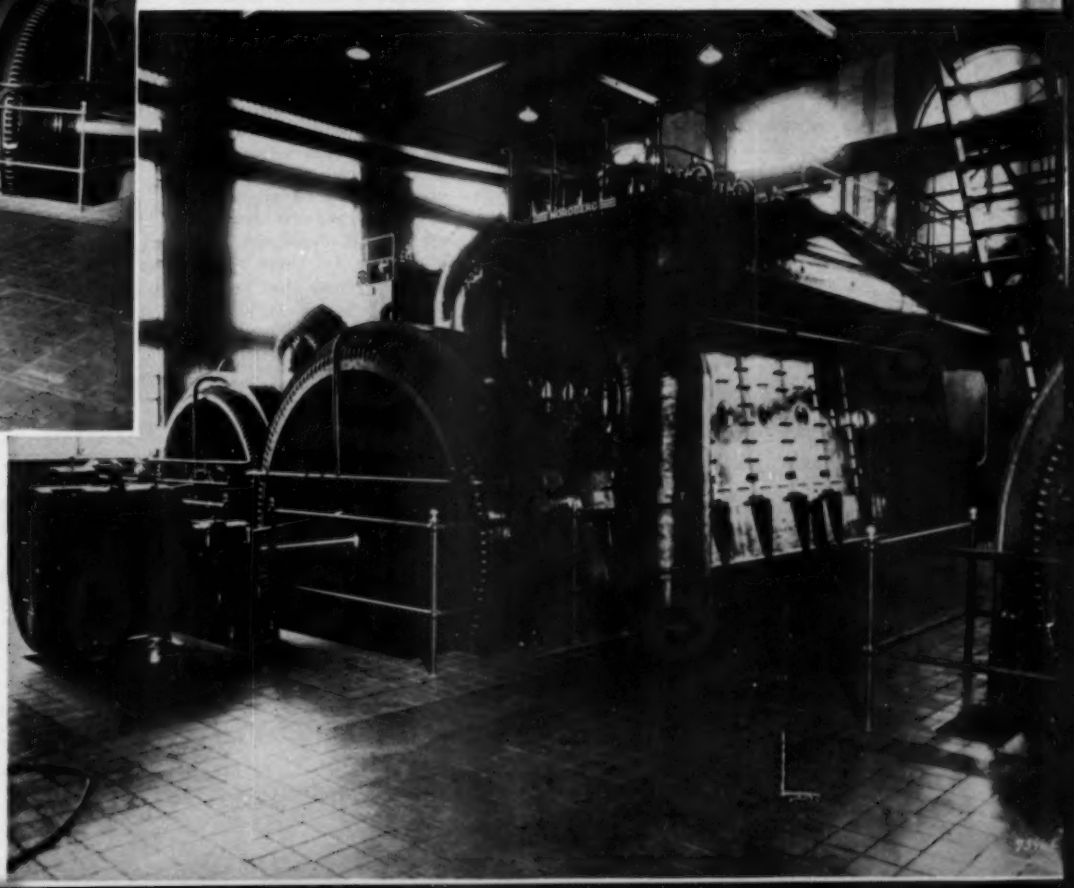
This clean, high-grade fuel presents no special handling problems. Other than the usual duplex, bag-type pressure filter on the engine, no cleaning equipment is deemed necessary.

In lubricating oil handling, the new engine differs from the 3,000 hp. unit in that there is no engine-driven pump to circulate oil for bearing lubrication and piston cooling. Instead there are two identical 360 gpm. pumps driven by 25 hp. motors. One pump handles the engine adequately while the other serves as a standby and is arranged to start automatically if lubricating oil pressure fails. Plant engineers feel the new set-up is more dependable and easier to service. Every precaution is taken to keep the lube oil free of contaminants that might harm the engine. The circulating pump draws oil from the sump tank and puts it through a strainer, a cooler and a magnetic filter before sending the lube oil to the engine. The magnetic filter eliminates any metal particles. In addition, there is a small motor-driven pump which draws

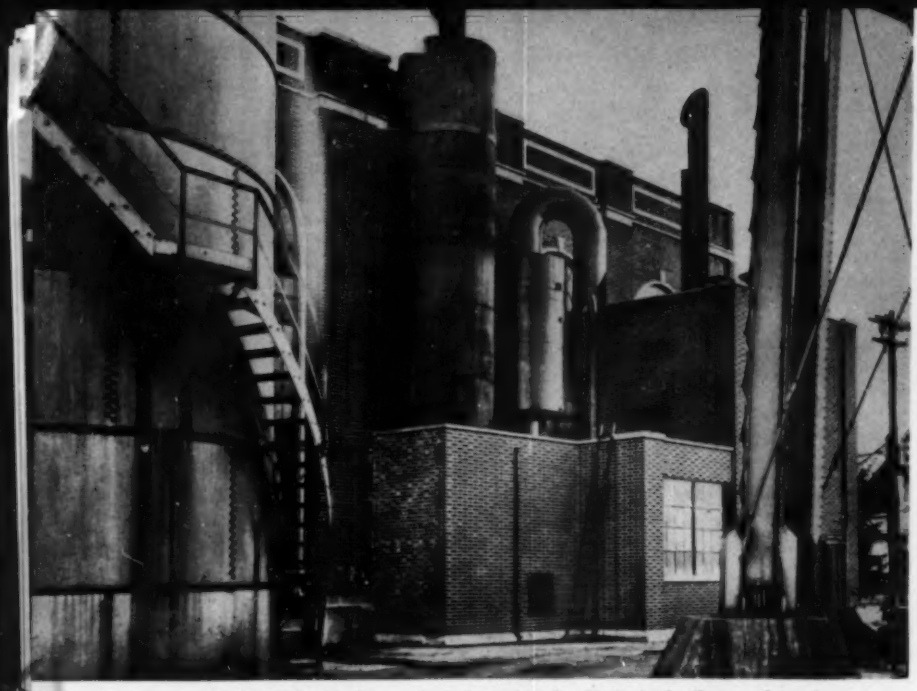
TABLE I

Year	Total KWH Gen.	Peak KW	Fuel Oil Gal.	KWH per Gal.
1928-29	2,579,100	1,680	244,619	10.54
1929-30	5,829,900	2,140	552,516	10.57
1930-31	7,391,500	2,520	673,966	10.97
1931-32	8,572,600	2,900	775,150	11.06
1932-33	9,281,200	2,920	821,359	11.30
1933-34	9,956,100	3,020	837,686	11.89
1934-35	10,537,400	3,125	877,543	12.01
1935-36	11,377,000	3,440	940,730	12.09
1936-37	12,365,400	3,600	1,028,507	12.02
1937-38	13,229,100	4,050	1,095,073	12.08
1938-39	14,151,000	4,300	1,140,644	12.41
1939-40	15,259,500	4,500	1,220,756	12.50
1940-41	15,779,500	4,850	1,271,429	12.41
1941-42	16,334,700	4,950	1,300,522	12.56
1942-43	14,290,600	3,750	1,100,113	12.99
1943-44	14,883,900	4,050	1,170,520	12.72
1944-45	16,133,000	4,250	1,233,376	13.08
1945-46	17,431,500	5,125	1,314,215	13.26
1946-47	19,377,800	5,425	1,465,056	13.23
1947-48	21,963,600	6,000	1,652,899	13.29
1948-49	24,154,300	6,700	1,833,354	13.17
1949-50	26,831,100	7,400	2,038,137	13.16
1950-51	29,532,400	8,300	2,229,179	13.25





This view of the 3830 hp. Nordberg engine shows the Roots-Connersville scavenging air blower, the Westinghouse generator and the Electric Auto-Lite thermometers.



Air for 3850 hp. Nordberg engine is drawn through a Maxim intake silencer and American air filters in a brick filter house. Exhaust gases pass through a vertical Maxim silencer. The larger brick enclosure at right houses the 3000 hp. engine's exhaust silencer which is arranged for waste heat recovery.

oil from the bottom of the sump tank, puts it through an 18-cartridge cellulose filter and back to the sump. There is a separate mechanical lubricator for each cylinder.

Lubricating oil economy has been particularly good in the case of the big diesel. In its first 909 hours of operation, the engine consumed only 417 gal. of lube, an average of 8,392 hp. hr. per gal. Rockville Centre's ingenious cooling tower was more than adequate to take on the added load of the new engine. This tower is an old standpipe erected back in 1895. Sections have been cut in the sides to permit atmospheric cooling. Red-wood filling and distributors and a two-speed, motor-driven induced-draft fan have been installed to provide a highly flexible cooling tower with great capacity. Addition of the 3,850 hp. Nordberg engine required only the expansion of pumping capacity which was accomplished by installation of a 1500 gpm. centrifugal pump driven by a 100 hp. motor. This brings the number of pumps in the system to five and increases total capacity to 4,000 gpm.

Air for the big two-cycle, port-scavenging engine is drawn through an intake silencer and a battery of filters of the viscous impingement type. Air goes then to an engine-driven blower of 18,000 cfm. capacity, then through the intake header to the cylinders. In previous installations, provision was made for utilization of heat from the exhaust. Two of the old engines were equipped with waste-heat boilers and the 3,000 hp. engine's exhaust silencer was enclosed in a brick housing with a motor-driven blower to send exhaust-heated air into the plant during the winter months. The heat balance of the plant was such that no further waste heat could be utilized profitably and so the new engine exhausts through a vertical silencer with no provision for heat recovery. The largest Nordberg diesel is served by a convenient gauge and alarm panel which holds a multi-point exhaust pyrometer, gauges for water, lube, fuel and starting air, alarms for jacket water and lubricating oil pressures and temperatures, and control switches for the two lube pumps and a fuel booster pump.

TABLE II — March 1, 1950 — February 28, 1951

Unit	Hrs. Run	KWH Generated	Fuel Oil Consumed	Ave. Load	Running Cap. Factor	KWH per hr.	Lube Oil Consumed
No. 2* (1250 hp.)	59	31,400	2,922	532	62.6	10.75	15
No. 3 (1250 hp.)	329	178,400	16,736	542	63.8	10.66	98
No. 4 (1250 hp.)	2,332	1,266,200	110,697	543	63.9	11.44	585
No. 5 (2865 hp.)	5,154	7,529,200	576,688	1,461	73.0	13.05	2,388
No. 6 (2865 hp.)	4,965	7,253,700	557,457	1,461	73.0	13.01	2,258
No. 7 (3000 hp.)	7,744	11,651,500	851,466	1,504	75.2	13.68	3,501
No. 8x (3850 hp.)	909	1,622,000	113,213	1,784	65.6	14.33	417
TOTAL	21,492	29,532,400	2,229,179	1,374	72.9	13.25	9,262

*Removed to make room for No. 8.
xInstalled Dec. 19, 1950.

To attain the long efficiency record of the Rockville Centre plant required both good equipment and expert operation. Chief Engineer W. E. Van Deusen and his experienced assistants hold as closely as possible to preventive maintenance program designed to keep the prime movers at peak performance levels. Indicator cards are taken and an inspection data sheet is filled out once a week for each engine. Corrective action is taken promptly if there is any evidence of trouble. On the two-cycle engines, pistons are pulled for inspection every 3,000 hours. All maintenance work is scheduled in such a manner that the engines are ready for service to help carry the peak loads. Part of the plant's success must be attributed to the close coordination of operating and policy-making personnel. Not only are we fully conversant with the day-to-day operating problems of the plant, but we maintain a close liaison with village officials who traditionally have fostered sound, long-range development. Mayor W. Harry Lister and Trustees Henry S. DeMott, Julius C. Behnke, Joseph Huber and John A. Anderson were very instrumental in establishing the policy of power generation and distribution.

Through the years, Rockville Centre has consistently improved its equipment and its efficiency record. The new 3,850 hp. Nordberg diesel engine, operated at just 65 per cent load during its break-in period, has set a new plant mark of 14.33 kwh. per gal. of fuel. When boosted to better than 75 per cent load, in accordance with regular operating practice, the new engine certainly will lead the plant to new heights.

Equipment on New Nordberg

Engine—One 3,850 hp. two-cycle, mechanical injection, 21½-in. x 31-in., nine cylinder diesel operating at 225 rpm. Nordberg Mfg. Co.
Generator—Westinghouse.
Fuel oil—Esso No. 4. Esso Standard Oil Co.
Fuel filters—Wm. W. Nugent & Co.
Fuel injection pumps—American Bosch Corp.
Governor—Woodward Governor Co.
Lubricating oil—DTE #3 in crankcase. DTE #5 in cylinder.
Lube oil pumps—Two Quimby Rotex pumps. H. K. Porter & Co.
Lube oil strainer—Nordberg Mfg. Co.
Lube oil cooler—Ross Heater & Mfg. Co., Inc.
Magnetic filter on lube—Nordberg Mfg. Co.
Cylinder lubricators—Manzel Inc.
Lube oil filter—Hilco Hyflow. The Hilliard Corp.
Cooling water pump—One 1500 gpm. centrifugal pump driven by 100 hp. Westinghouse motor. Ingersoll Rand Co.
Intake silencer—Maxim Silencer Co.
Air filters—American Air Filter Co.
Exhaust silencer—Maxim Silencer Co.
Blower—Roots-Connersville Blower Corp.
Gauge board—Nordberg Mfg. Co.
Pyrometer—Alnor, Illinois Testing Labs.
Alarms—Viking Instruments Inc.
Gauges—Lonergan.
Switches—Cutler-Hammer, Inc.
Thermometers—Electric Auto-Lite Co.
Voltage regulator—General Electric Co.

THE 10,000th

SIX hundred national railroad executives and Chicago area industrial and civic leaders witnessed commemoration of the 10,000th General Motors diesel locomotive unit in ceremonies at the Electro-Motive Division plant at LaGrange. The 10,000th unit, a 2,250 horsepower passenger locomotive, was delivered to the Wabash Railroad by B. A. Dollens, vice president of General Motors and general manager of Electro-Motive Division, after talks by Charles E. Wilson, president of General Motors, and Charles F. Kettering, research consultant. In delivering the unit to A. K. Atkinson, president of the Wabash, Mr. Dollens paid tribute to those outside of Electro-Motive who helped make the production record of 10,000 units within a span of 15 years possible. "You can give an unskilled mechanic the finest tool in the world and he will not get very far with it," Mr. Dollens pointed out. "Give it to skilled men and you get great results."

Mr. Dollens, before presenting Mr. Atkinson with a gold-plated control lever in token of delivery of the 10,000th unit, called attention to the strides made by the Wabash in converting from steam power to diesels. "I understand that the Wabash is working toward complete dieselization by the end of 1952 and that by the end by 1951 you will have 100 per cent dieselization of through passenger service, 82 per cent of gross ton miles of freight will be handled by diesel, and 89 per cent of the switching locomotive miles will be done with diesel."

During the day, guests saw latest product developments and newest improvements in manufacturing processes. An example of the former is an experimental 340 horsepower hydraulic switching locomotive, powered by two General Motors 6-71 diesel engines equipped with Allison torque converter transmissions. This unit, designed for industrial switching use, is a developmental project, officials said, and is not now scheduled for production.

Pictured at ceremonies at the LaGrange, Ill. plant of Electro-Motive Division, General Motors, commemorating completion of the 10,000th General Motors diesel locomotive unit (Wabash E8 2,250 hp. passenger locomotive in background) are, l. to r.: E. R. Buck, of Decatur, Ill., general superintendent of motive power, Wabash Railroad; Charles F. Kettering, research consultant and director, General Motors; G. H. Sidz, vice president, operations, Wabash Railroad, St. Louis; B. A. Dollens, vice president of General Motors and general manager, Electro-Motive Div.; A. K. Atkinson, president, Wabash Railroad; and C. A. Johnston, general manager, Wabash Railroad, both of St. Louis.

Waiting a turn at driving a new, experimental 340 hp. hydraulic switching locomotive, equipped with Allison torque converter transmissions, and built by Electro-Motive Div., General Motors, are these railroad, industrial, and civic leaders who visited Electro-Motive's LaGrange, Ill. plant to attend ceremonies marking completion of the 10,000th General Motors diesel locomotive unit. They were among 600 railroad executives from across the country and Chicago area industrialists and leaders who saw the 10,000th unit, a 2,250 hp. passenger locomotive, delivered to the Wabash Railroad.

SAND AND GRAVEL DIESELS

By ROY JOHNSON

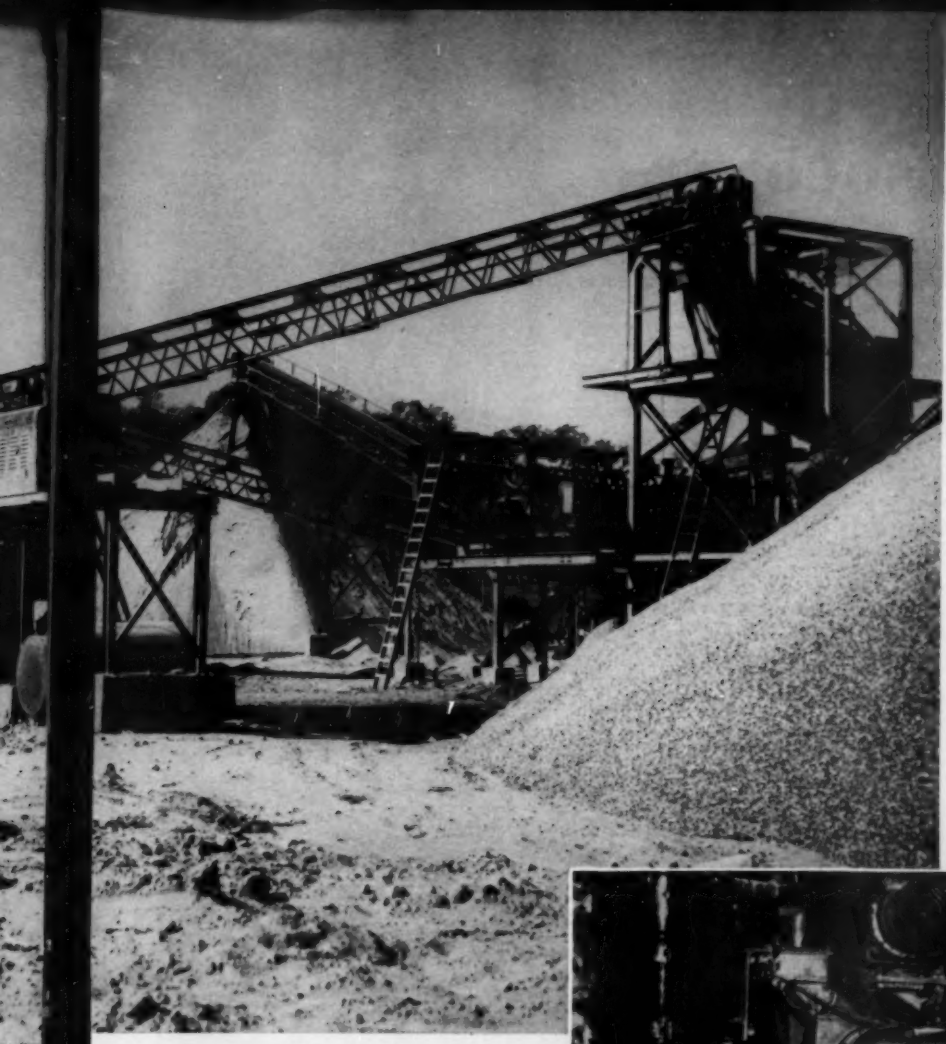
SAND and gravel doesn't mix very well with groceries, but that is exactly the story of the four Massimo Brothers who own and operate the Waterbury Sand and Gravel Company of Waterbury, Connecticut. With a large family to keep in clothes and food, John Massimo, Sr., allowed himself to be talked into investing three-hundred dollars in a small grocery store, by his oldest son, Dominick. With his sons to assist him, the business slowly grew and the profits acordingly increased. They increased to such an extent that a new building was erected only two and one-half years later in 1919. Sales continued to mount and it was not long before they had to move into larger quarters. Business continued to improve and the four brothers began eyeing other fields to invade. The result was the beginning of the Massimo Coal Company which came into being in 1926. Starting out with a one ton delivery truck, the golden touch of the Massimo's continued. The business grew in leaps and bounds and it was not long before it was one of the largest coal companies in the city of Waterbury, Connecticut.

In 1945, no longer able to sit still with their booming coal company, they bought two Mack trucks and instituted the Massimo Oil and Fuel Company. Now, after five years operation, they are one of the largest retail fuel oil dealers in the vicinity, owning three tractor trailer trucks, capacity—each 4400 gallons, and six other trucks, capacity 1200 gallons each. Confronted by the fact that there was a slack period in their coal and oil business, the four Massimo Brothers were very desirous of keeping their present employees busy and happy all year round. One day, when Dominick Massimo was driving through the country-side near Waterbury, he spotted a tract of land that looked very good for gravel production. After inspecting the ground more closely, it became evident that gravel was readily available. Twenty-six test holes were sunk to determine the quality of the gravel and it was found to be, in Dominick Massimo's words, "The most beautiful gravel you could want." 120 acres of land were purchased—located in Prospect, Connecticut, just outside of Waterbury, Connecticut, and their sand and gravel plant was set up there.

The Eastern Engineering Sales Company of Boston, Mass., laid out the entire plant which crushes the rock, screens it properly, washes it and conveys it to piles for delivery to the trucks. The raw material is brought by truck to a large steel hopper which is fitted with a snytron vibrating

General view of the Waterbury Sand and Gravel Co., Waterbury, Conn., showing the second conveyor leaving secondary tower to scalping screen and thence to sand washer and stock piles.

Officers of Waterbury Sand and Gravel Company, left to right: Dominick Massimo, President; Louis Massimo, Vice President; Michael Massimo, Treasurer; and John Massimo, Secretary.

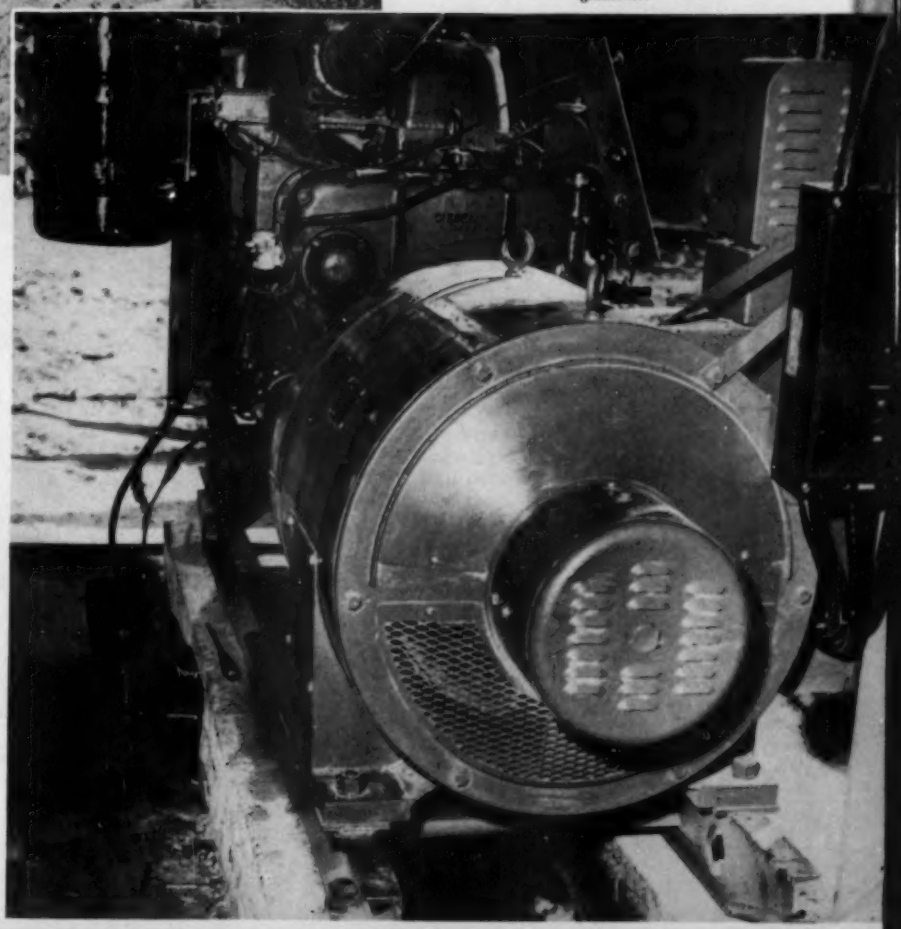


feeder with grizzly bars spaced three inches apart. The material passing through the grizzly bars travels to the primary crusher. After passing through the primary crusher, this material goes on to a conveyor belt to the first tower which contains a 3'x8' double deck scalping screen. The crushed rock passing over the decks goes into a gyratory reduction crusher which is conveyed back on number one belt which feeds the scalping screen. All materials passing through the scalping screen are carried on a second belt conveyor to the secondary tower which contains a three deck 4'x12' vibrating screen. The material (all stone) is sized and passed on to belt conveyors to various stock piles. The sand, of which there are two sizes, one for masonry and one for concrete, is passed on to sand washers and from there onto belt conveyors to the different stock piles. When the plant was contemplated it was decided that diesels would drive the crushers and also would furnish electric current.

The Fairbanks-Morse model 49 diesel engine was chosen by the Massimo Brothers as the unit best suited for their needs. Three units were bought. A 3-cylinder, 60 HP, model 49A4½ power unit was supplied for driving the primary crusher while a 6-cylinder model 49A4½ diesel unit, rated 120 hp, drives the secondary crusher. Both diesel units drive the crushers through V-belts, each with a ratio of 4.36:1. The diesel engines are installed in sheet metal enclosures as protection against the elements. Other engine equipment includes oil bath air cleaner, Twin Disc clutch, radiator and centrifugal water pump, exhaust muffler, electric tachometer, 24 volt electric starting motor and charging battery generator, lubricating oil cooler and automatic shut-off control for low lube oil pressure and high water temperature. To supply electrical power to run the plant, it was decided to purchase a Fairbanks-Morse 6-cylinder model 49A4½, 75 kw, ac. generating set. The unit is housed in a small brick building in the center of the sand and gravel pit. Engine equipment is similar to the diesel units, excepting that the sheet metal enclosure is not required.

The productive capacity of the sand and gravel as originally set up, would equal 150 tons, although this capacity can be increased any time the plant operators feel the need for a substantial increase. An additional model 49A4½, 4-cylinder diesel unit, rated 90 hp., was recently purchased to drive an existing water pump. This unit will be used to supply all the water requirements for sand washing at the plant site and replaces an existing gasoline engine that has been in operation only six months.

End view of 75 kw diesel generating set (6-cylinder Model 49A4¼ Fairbanks-Morse) showing intake filter and ac. generator.



DIESEL SHIP "LA CROSSE SOCONY"

THE Socony-Vacuum Oil Company of New York on Monday, June 18, 1951, at Cairo, Illinois, accepted delivery of the diesel ship *La Crosse Socony*. Built by St. Louis Shipbuilding & Steel Co., the *La Crosse Socony* is the fastest and most powerful of the Socony inland river towboats, and is one of the most powerful on the inland waterways. The hull is 156 ft. long, 35 ft. wide and 11 ft. deep with a normal draft of 8 ft. and is of St. Louis Ship standard rugged construction with heavy hull plating and all bulkheads of 3/8-in. plates, stiffened both vertically and horizontally. The bow is of the modified scow type with smooth flowing waterlines, and the stern lines fair into a pair of Kort nozzles and Contraguide rudders.

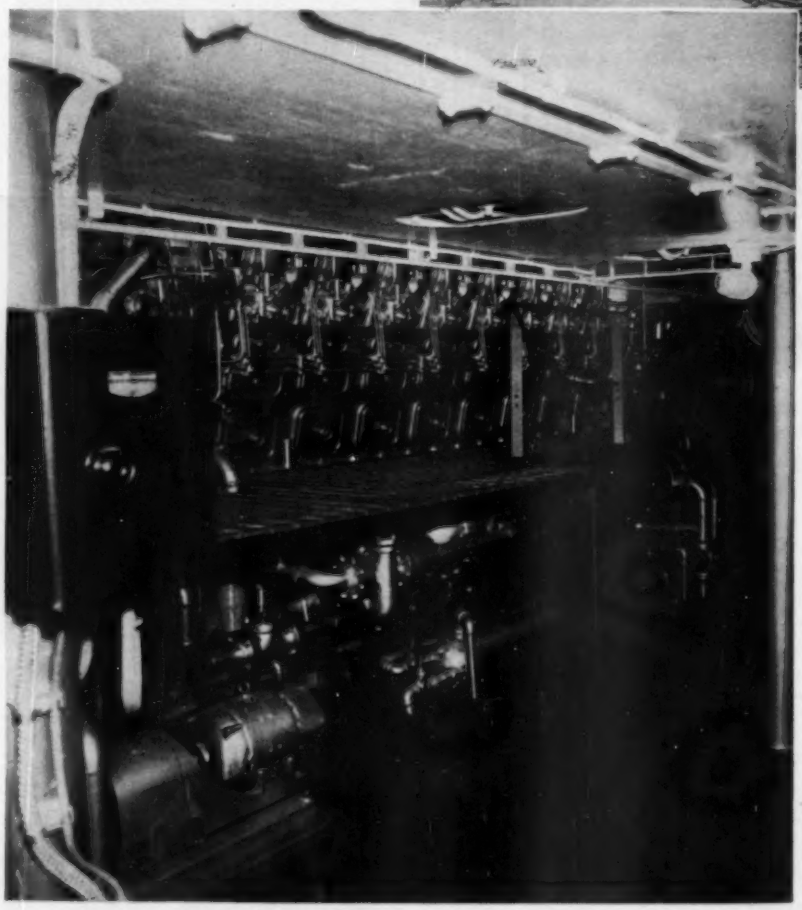
In appearance the *La Crosse Socony* resembles the other Socony towboats except that it is larger than either the *Kansas City Socony*, the *St. Louis Socony* or the *St. Paul Socony*. The deckhouse is of steel with steel and masonite interior bulkheads. All quarters, mess rooms and lounges are lined with tempered masonite and all exposed walls and ceilings are insulated with 2 inches of fibreglas. The ceiling and side walls of the engine-room are soundproofed with Johns-Manville acoustic transite and J-M acoustic blanket. All sash is Truscon steel sash and all outside doors are of steel weathertight construction.

The heating and ventilating system of the *La Crosse Socony* is of unusual design and was designed by the Marine Department of Socony-Vacuum, and provides heated forced circulation of air in the winter-time and forced circulation of outside air throughout the quarters in warmer weather. This system also provides a circulation of air between the outside steel plating and the masonite lining, and should eliminate any corrosion of the steel.

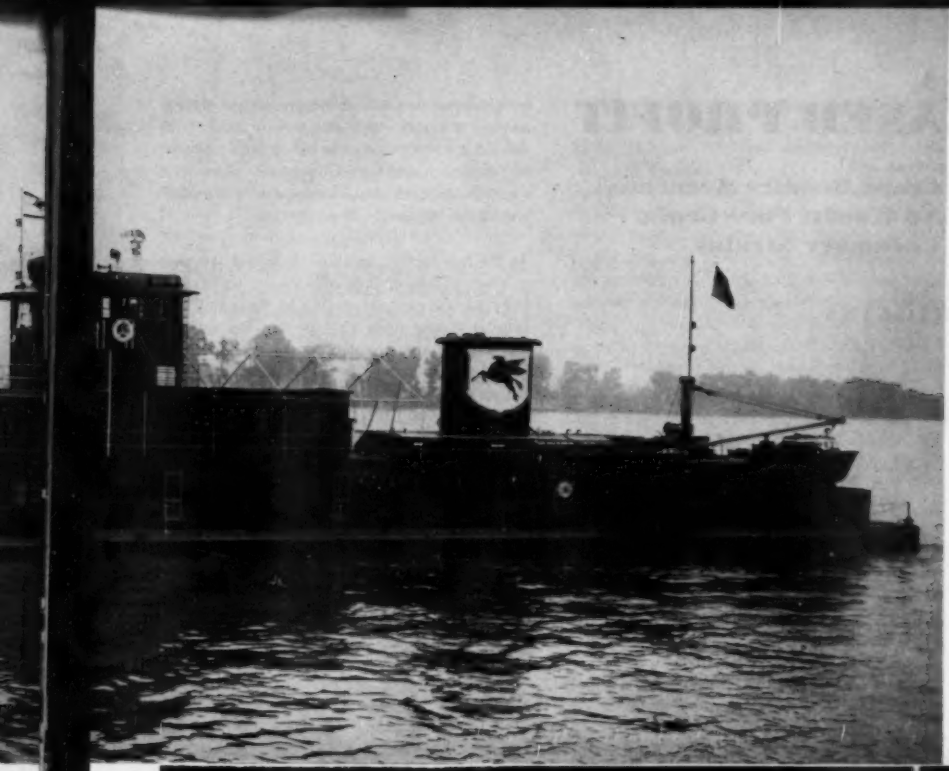
On the main deck, quarters are provided for two cooks and 12 crew members. These staterooms are large and each has its own lavatory. One large bath located at the forward end of the passageway serves this deck. A large and conveniently arranged galley serves both the crew and officers' mess. All quarters, engine-room and pilot house can be reached by stairs and passages located inside, which is advantageous during inclement weather. The second deck contains a captain's suite with bedroom, living room and private bath. The chief engineer has a large stateroom with private bath, while the two pilots and two assistant engineers share the third bath on this deck. A spare bedroom and lounge complete the arrangement. The galley and mess rooms are extremely large and well arranged with ample cupboard space for storage. The galley has an electric stove, a 43 cu. ft. refrigerator and an 18 cu. ft. deep freeze. Work surfaces and serving counters are provided as well as a stainless steel sink. All requirements of the U. S. Public Health Service have been met as is attested by their certificate.

Propulsion of the *La Crosse Socony* is provided by two General Motors (Cleveland) diesels, model 16-278A and Falk reverse-reduction gears, each driving a four blade 102-in. diameter propeller. Electrical power is provided by two General Motors (Cleveland) diesels, model 3-268A generator sets, 100 kw., 120-240 volt, d.c. Power is controlled and distributed through a dead front switchboard.

A Walter Kidde fire extinguishing system is provided for the main engine room and auxiliary machinery compartment, with a hose reel located on the upper deck. The auxiliary machinery and equipment consists of two Gardner-Denver 8 cfm., 5 hp. air compressors; two Goulds 100 gpm., 7½ hp., fire pumps; one National Transit 100 gpm., 5 hp., bilge pump; one Viking 35 gpm., 2 hp., fuel oil transfer pump; one Viking 35 gpm., 2 hp., fuel



Lower engine flat of the *LaCrosse Socony* showing part of one of the General Motors Cleveland diesels—model 16-278A.



oil emergency feed pump; two Fairbanks, Morse 425 gph. automatic water pressure sets; one Crane oil fired hot water heating boiler; one 66 gallon hot water tank for sanitary water and one Sepco 30 gallon electric hot water heater for potable water; a St. Louis Shipbuilding & Steel Co.'s steering system with two hydraulic cylinders, two 10 hp. hydraulic pumps, control valves and electric-hydraulic follow up controls; two Schoellhorn-Albrecht 15 hp. double barrel capstans; two Carlisle and Finch 19 inch arc searchlights; three 500 watt floodlights, one Kahlenberg 8 inch Triplex air whistle and a whistle light; main diesel engines are protected by an automatic alarm system for water and oil temperature and pressures; General Motors electric pilot house controls for the main propulsion engines.

The *La Crosse Socony* is not only the largest and most powerful of the Socony river fleet but, equipped with Kort nozzles and Contraguide rudders, it is one of the most powerful and modern towboats on the rivers today.

Mrs. W. B. Jupp, W. B. Jupp, Mrs. F. R. Pratt, Captain E. W. Fiske, Jr., Mrs. E. W. Fiske, Jr., Mrs. Parker Wise, F. R. Pratt, Parker Wise, W. E. Burt, S. B. Parnell, C. A. McWilliams.

DIESELS INCREASED PROFIT

McKeehan's Certified Seed Crops Require Accurate, Scientific Know-How With No Weeds: Pure Grain, Rice, Bean, Melon and Cucumber Strains

By F. HAL HIGGINS

CLEAN, scientific farming powered by diesel engines pays handsomely for S. Atwood McKeehan. Mr. McKeehan is one of the top farmers of Sutter county, in the Sacramento Valley, with a practically weedless 1,500 acres of the best bean, rice, small grain, melon and cucumber crop lands. His mechanized control of weeds permits him to specialize on the production of certified seed crops. His farming operations are now concentrated on pure field seed growing. That the 1,500 acre McKeehan farm was one of the best managed in northern California was noted some years back as the writer gradually became acquainted with the key farmers of the state in the production of standard crops and specialties. McKeehan was getting into certified rice seed production almost as early as any individual growers in the State. On a recent visit to see all of the McKeehan diesel engines at work in harvesting of rice, beans and vine seed crops, the farmer was asked to explain his certified seed production for the readers of DIESEL PROGRESS.

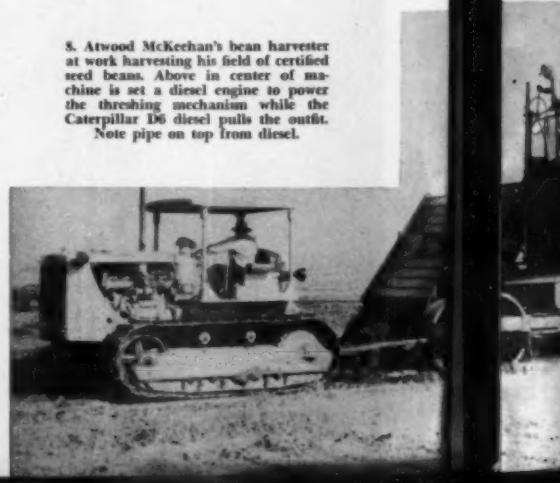
The McKeehan ranch is not only the cleanest ranch from weeds the writer can recall seeing in the Sacramento valley, but it is about as nearly completely dieselized as can be done at this time. Three years ago the drought caught California so hard that rationing of electric power started a rush for diesel engines to replace electric high line power. At that time, McKeehan bought six war surplus diesel engines and immediately installed one of them on a pump to replace the power line shortage. These were all Gray marine diesels. One was soon installed on the old Harris combined harvester that harvests both grain and rice on the McKeehan certified seed operations. Noting three of the war surplus diesels still setting in the shop, the visitor asked what he intended doing with them. "They'll come in handy some of these days, and they won't spoil right here where I can get them and hitch their power to some new or old machine," the owner answered. Under his eye and advice his ranch shop man can build about anything wanted. Asked how many diesels he now has on his beautiful clean ranch that produces practically only certified seed, the owner checked his equipment over for a minute: 2 Cat D7s, 1 D6, 1 RD40, 1 D4, 1 GM-powered California special grain and rice harvester, 1 GM-powered bean harvester, and the the 3 war surplus GM engines ready for instant use if and when needed. All are lubricated, greased and tanked up with Socony-Vacuum products. There is a lot of competition for the California ranch business among Shell, Standard of California, Union, Associated and General Petroleum. Some of the ranch accounts add up to $3,500 a month and higher, the writer has found, and all give fine service in delivering diesel and other fuels, greases and oils to the ranch headquarters or out to the fleet of tractors, combines and other power farming equipment when needed.

Mr. McKeehan thinks the production of certified seed as the road to sound long-pull farming so important he not only pointed to Loren Davis' new bulletin on California Rice Production, but insisted on carefully writing out his own thoughts and experiences as regards certified seed. Said Davis, who was in charge of the USDA rice station at Biggs for several years before being stationed at the University of California Agricultural College as a rice specialist: "Certified seed is a good investment. Use of certified seed grown under the regulations of the California Crop Improvement Association is the only assurance that varieties can be kept pure. It should be realized that certified seed, even at premium prices, is an excellent investment. The premium paid for such seed is a minor item in the cost of production because pure seed is a very important factor in the production of a profitable crop." McKeehan then took the writer out to his bean harvester, which proved to have been dieselized in his ordinary ranch shop such as any farmer might own, without much expense. "Bean growers have one major problem in mechanical injury," he quoted the Agricultural Extension Service on certification. "It is injury from impact of the bean on any part of the machine if falling more than a few inches." Hence, bean harvesting is something that has had a lot of attention from the agricultural engineers at Davis where the problem was worked out by reducing falls of over 1½ feet or padding to cushion the impact of beans on machines in threshing and recleaning. So, the speed of the diesel tractor pulling the harvesting machine and the application of the other diesel power in the threshing and conveying of the beans is all important for a high germinating seed bean. McKeehan is located in the heart of the finest bean area in California. It is one of his standard crops.

Rice is confronted with two hazards peculiar to that crop: airplane seeding creates a field contamination problem. Hence, rice seed fields should never be next to other rice fields of other varieties of rice not grown for certified seed. In drying the crop, either the grower should have his own drier with no other grower using it, or he should dry in a pot-hole drier to maintain the identity of the rice from harvest to seeding. For grain grown for certified seed, the problems are easier as there are few weeds since the advent of 2, 4-D as a weed control chemical sprayed on the fields from planes. Re-cleaning is another problem that inexperienced growers often find difficult because of over-feeding and use of round hole bottom screen. As an experienced and careful student of all these obstacles to getting certified seed for premium prices over the years, McKeehan has whipped it by machines and brains—mechanized management.

As the harvester, or combine, is one of the most common sources of impurities appearing in certified seed, it is carefully checked by the county agricultural commissioner and the first five sacks of the crop coming through the machine are discarded to eliminate as far as possible any contamination from old seeds of the same or other crops from getting into the newly harvested seed. The cleaning of the machine before starting is a difficult job and one that inexperienced combine men are likely to do too hastily to get all the foreign and old seed out. It takes at least two hours to properly clean a machine; drapers, screens and chaffers should be removed and compressed air and water under pressure will get good results. If the agricultural commissioner thinks it necessary, he will personally inspect the machine before it starts on a certified seed harvest. Sutter county is fortunate in having an agricultural commissioner who has done a grand job of educating his growers to the needs and getting the full cooperation of some 40 of them who have grown certified rice seed the past two years.

While nearly a hundred varieties of field crops are now certified in California, only those varieties that show definite superiority, adaptation or specific uses are included in this certification, points out F. G. Parsons, specialist in Agronomy at the University of California's college of agriculture. The writer encountered Mr. Parsons on the special Rice day at the USDA station at Biggs in 1949 and recalls the emphasis he laid on the work of seed certification in lifting the whole California crop to higher quality and yields by such a program if and when followed for some time by a large percentage of the growers. The question of what varieties to certify are determined by the Agricultural Experiment Station and the California Crop Improvement Association. The Association operates within the college of agriculture to do for farmer and pure seed industries duties like those of the pedigree divisions of the livestock breed association. Cooperating closely are the Agricultural Extension Service, State Department of Agriculture and the County agricultural commissioners. Briefly, the certified seed work is



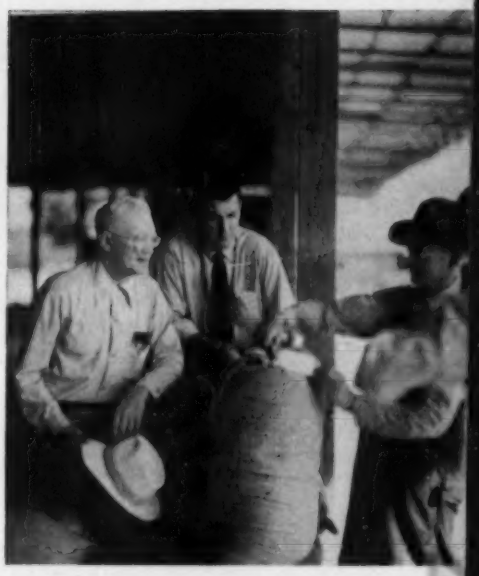
S. Atwood McKeehan's bean harvester at work harvesting his field of certified seed beans. Above in center of machine is set a diesel engine to power the threshing mechanism while the Caterpillar D6 diesel pulls the outfit. Note pipe on top from diesel.

in very capable and unselfish hands and guided by the highest motives to lift the State's agriculture to leadership in agriculture via better seed. But always, this California agriculture is powered by and geared to more and better machines operated by more skillful operators or workers to get the top results in quantity and quality.

Isolation of Field: The grower must separate with a definite boundary any field which is producing seed for certification. Such a boundary can be a fence, ditch, levee, roadway, or barren strip at least ten feet wide. Crops which cross-pollinate must be separated a much greater distance from fields of another variety with which crossing is likely to occur. Isolation requirements vary depending upon the crop and class of seed to be produced. For alfalfa, the distance is 500 feet; for red clover, 500 feet; for milo and sudan, 660 feet; for Ladino clover, 660 feet; for forage grasses, 660 feet. For registered and foundation seed the requirements are greater. Crops containing primary noxious weeds will be rejected for certification at the time of field inspection. Whether the presence of secondary noxious weed will cause rejection depends on the difficulty of separating the weed seeds from the crop. Previous crops: only land totally free of volunteer plants of the same crop may be used to grow certified seed. This is true unless those volunteer plants are of the same variety and are growing from seed which was produced by certified seed. This means that the land must not have grown the same crop—unless it is of the same variety certified—for a certain length of time. For cereals (wheat, barley, oats), alfalfa, flax, rose clover, and sudan, that period is two years. For rice and milo the period is one year. For Ladino clover it is four years. Forage type grasses require five years. Source of seed: the classes of seed eligible to produce certified seed will be discussed, but usually the grower must procure planting stock through regular seed trade channels. Much of the foundation seed will be allocated by the Experiment Station through local farm advisors. So, if you wish foundation seed, apply to your farm advisor. Seed treatment: seeds of cereals and sorghums must be properly treated in order to prevent seed borne disease. Growers occasionally assume it is required of persons selling certified seed to have it treated, but this is not true. This is the responsibility of the person planting the seed. For specific details consult the farm advisor's office.

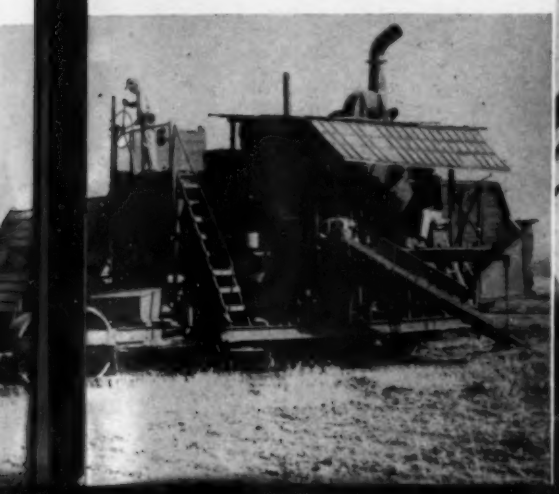
The care with which certified seed is produced under the checking of state officials and county advisor makes seed production an exacting and scientific business with special care to keep out both weeds and other varieties of the same crop. All of McKeehan's 330 acres of rice were certified and harvested in bags instead of in bulk in order to keep the identity of each and every bag through drying in a pot-hole drier. One hundred acres of barley, 250 acres of wheat, 630 acres of beans and 275 acres of vine crops—watermelons, cucumbers, muskmelons were grown on the ranch last season. The writer was lucky to see all his harvesting operations by the three big dieselized machines at work as they harvested rice, cucumber seed and beans.

The floods caught the McKeehan ranch in 1940 when the levees broke, but the war years since lifted the ranch under the businesslike management of McKeehan to the top in certified seed. Looking ahead to the expanding population and back at the war years that had dropped quality of crops from sloppy farming with not enough labor, machines and fertilizer, McKeehan saw it was time for a long up-hill up-grading of crops for cleaner fields and higher quality for more profit to growers. There was the matter of competition from other areas of this country and the foreign fields. Hence, he headed into a program of seed production for field crops. Yet, he planned this with that first big California requisite: "It must always be grown for mechanized farming," according to the late Prof. Mackie of the University of California Agronomy division. So, McKeehan not only continued to mechanize in the California grand style, but he made it with diesels.



McKeehan, left, watches County Advisor Pearl and the drier official seal a bag of his certified seed at the drier near Sutter, Calif.

Mounted on top of McKeehan's bean harvester is one of his six diesel engines to efficiently handle the threshing mechanism on his old Harris combined harvester.



LAKEFIELD, MINNESOTA

By WM. H. GOTTLIEB

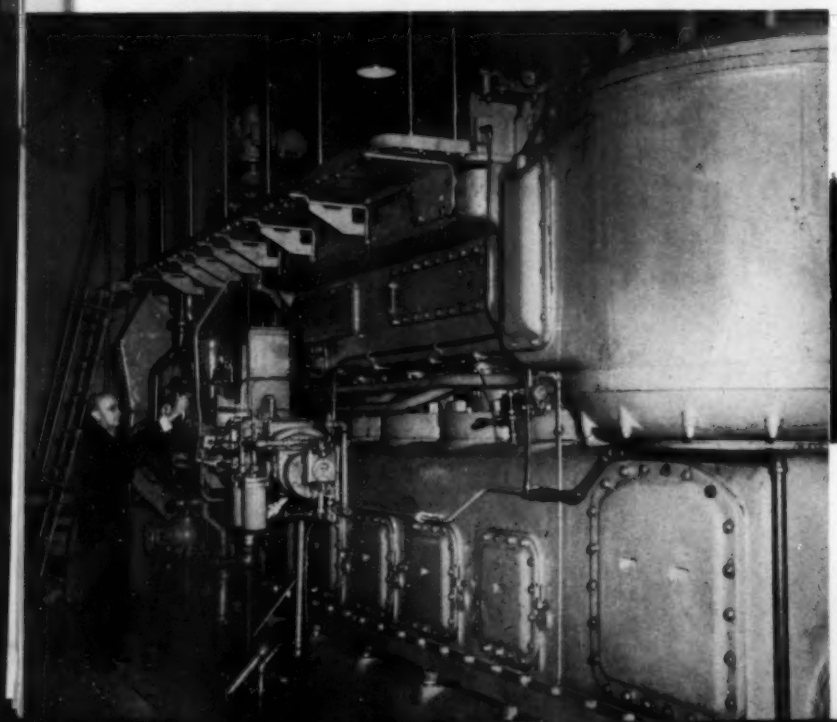
LAKEFIELD, Minnesota, is a residential community of 1,649 population but it has a thoroughly modern, profitable four-engine power plant of 2,950 horsepower. A crucial role in the financial stability of the plant is played by the newest and largest prime mover, a 1,400-hp. Fairbanks-Morse dual-fuel engine which has cut the cost of fuel per kw. hr. from 8.46 mills to 4.89 mills, a saving of 3.57 mills per kw. hr.

The municipal plant is an indigenous part of the pioneering tradition of America. Lakefield citizens banded together to provide themselves with electric power just 41 years after Minnesota was admitted to the Union. This first plant, built in 1899, was steam-powered. The village pioneered again in 1910 when it installed one of the early Worthington diesels and supplemented this unit in 1916 with a Busch-Sulzer diesel. The modern history of the plant started in 1935 when the first of the units now in service was installed. This was a 225-hp., 2-cycle, mechanical-injection Fairbanks-Morse diesel of the Model 32 series. The following year, a 450-hp. engine of the same type was put into service. In 1938, with the load expanding rapidly, Lakefield purchased an 875-hp., pump-scavenging Model 33 Fairbanks-Morse diesel, which was the mainstay of the plant through the war years. Concomitant development of local consumption and REA load after the war made further plant expansion necessary. In 1948, the town built a big, modern brick power plant and installed a 1400-hp. Model 33F16 Fairbanks-Morse diesel. This 7-cylinder, 2-cycle engine, with 16-in. bore and 20-in. stroke, develops rated horsepower at 300 rpm. Latest major improvement was the conversion of the 1400-hp. unit to dual-fuel operation in 1950. The big engine began regular service on natural gas fuel on June 1, 1950, though it ran intermittently on gas the previous month.

In the fiscal year ending June 30, 1950, the four-engine plant produced 4,264,700 kw. hr. and the newest unit contributed 2,191,600 kw. hr. of that total. But this was a balanced effort and all four engines played important parts. The 225-hp. unit ran 2,242 hours during the year, the 450-hp. ran 2,839 hours, the 875-hp. ran 2,728 hours, and the 1400-hp. ran 3,896 hours. The average for all the oil-burning engines was 12.41 kw. hr. generated for each gallon of fuel oil consumed. Gas is an economical fuel as compared with oil and Superintendent Felix Esping found greatest economy in his largest engine. With the cost of fuel oil at 10.5 cents a gallon, diesel production of 12.4 kw. hr. per gal. meant a fuel cost of 8.46 mills per kw. hr. In June and July, even with the load under 50 percent, the dual-fuel engine used just 3.54 mills worth of gas and 1.35 mills worth of fuel oil in producing a kw. hr., a total fuel cost of 4.89 mills. This represented a saving of 3.57 mills per kw. hr. The differential between the oil burning and gas burning units grows larger as the price of fuel oil increases. When last checked, the plant was paying 10.9 cents a gallon, Natural gas of 1,000 Btu. per cu. ft. cost an average of 23.3 cents per MCF.

The Lakefield plant is well designed and fully equipped. A detergent-type lubricating oil is used and cellulose filters keep it always in good condition so that no oil ever needs to be discarded. In the case of the two larger engines, lube is circulated continuously through the filters. A batch purifier serves the two smaller engines. The Model 33 units have oil-cooled pistons and are equipped with shell-and-tube oil coolers. Lube is circulated to the bearings and pistons by an engine-driven pump. A motor-driven auxiliary pump serves as a standby and also is used before starting and after shutting down the engine. Mr. Esping reports that wear is very small and that rings are always free. Gas-burning engines run cleaner and he expects to pull pistons every 12,000 hours instead of the 6,000 hour check which has been plant practice. Soft, treated cooling water is circulated through the engines and through coils in a forced-draft cooling tower by a pair of motor-driven centrifugal pumps with a third pump as a standby. A similar motor-driven centrifugal puts raw water over the tower and there are two additional pumps in reserve.

Fuel oil of 28 to 32 gravity is delivered by tank car and unloaded into storage tanks of 72,000 gal. capacity. The fuel is then pumped through an activated clay filter to a 4,000-gal. clean oil tank from which it flows to individual day tanks in the plant basement. Fuel is metered at the day tanks. Gas comes to the plant at 45 lb. presure, passes through a meter and then a regulator which reduces pressure to 25 lb. If the gas supply should fail, the dual-fuel engine would automatically switch over to fuel oil. Scavenging air passes through filters of the viscous impingement type. Exhaust gases exit through effective snubbers. There are two gauge and alarm panels, one for the Model 32 engines and one for the Model 33s.



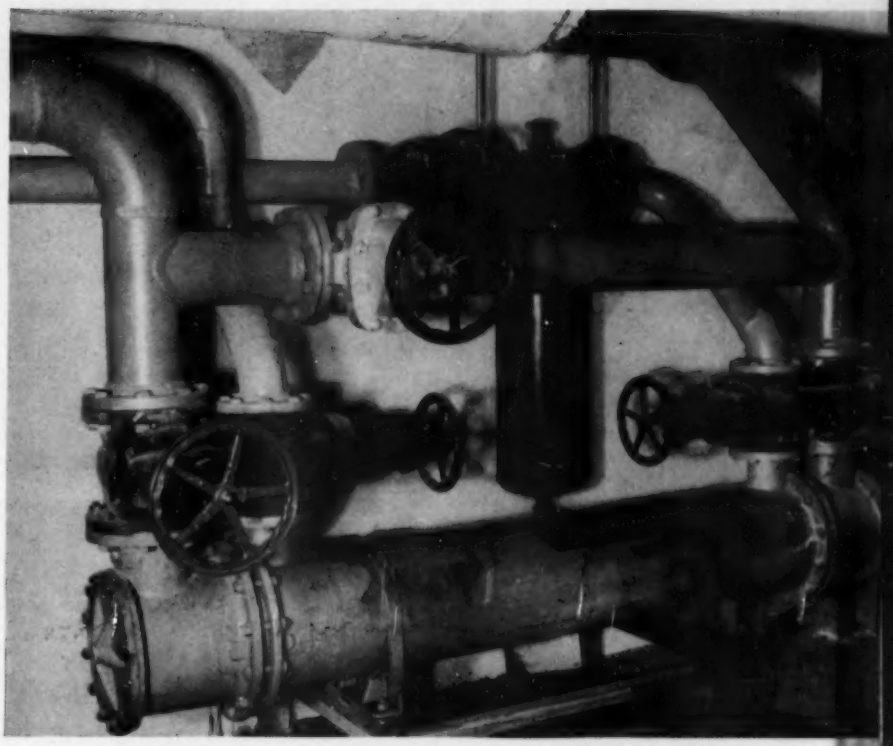
Superintendent Felix Esping starts the big dual-fuel engines.

Table of Equipment

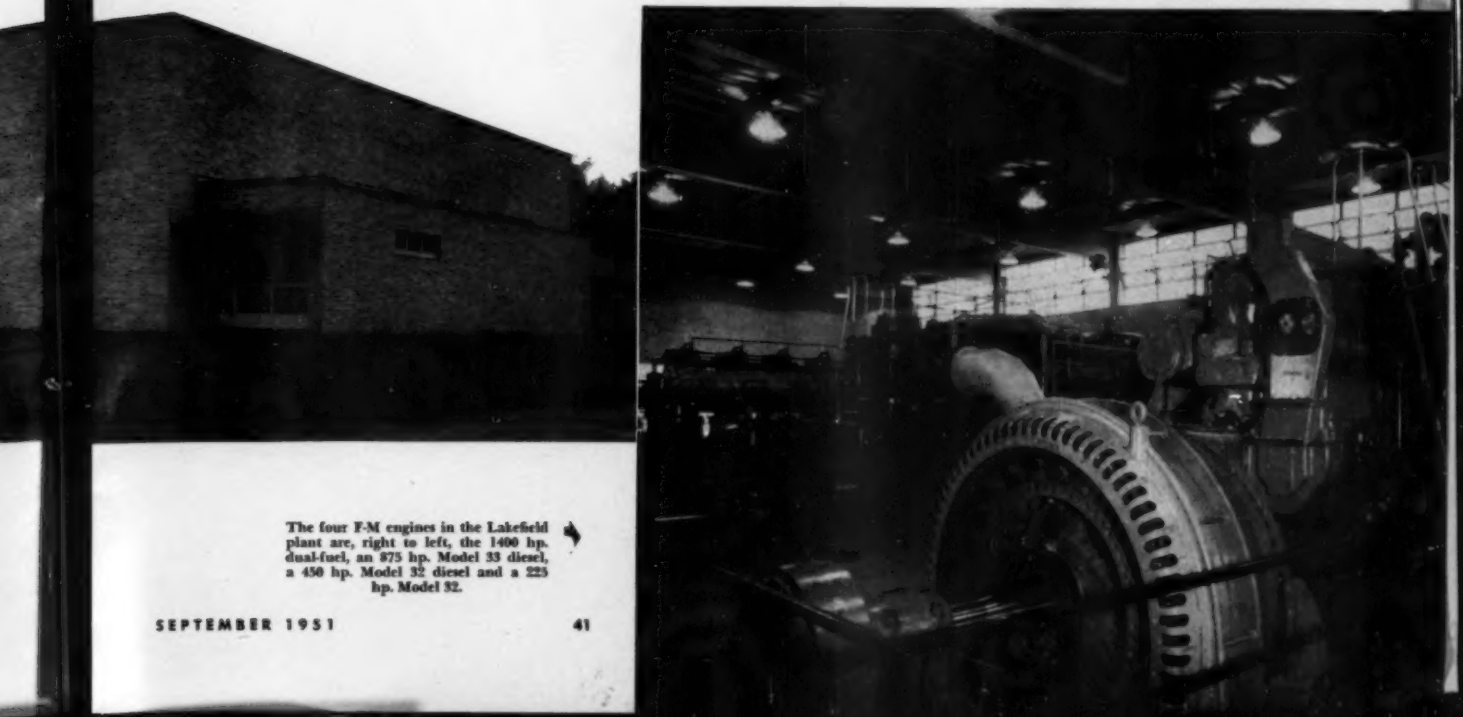
Engine—One 1400-hp., Model 33F16 engine converted to dual-fuel. Fairbanks, Morse & Co.
Generator—Fairbanks, Morse & Co.
Fuel filter—Honan-Crane Corp.
Fuel gauge—Liquidometer Corp.
Fuel meter—Pittsburgh Equitable Meter.
Fuel transfer pump—Viking Pump Co.
Natural gas—Minnesota Natural Gas Co.
Lube oil—Standard Oil Co. (Indiana)
Lube purifier—Honan-Crane Corp.
Auxiliary lube pump—Geo. D. Roper Corp.
Lube oil strainer—Purolator Products, Inc.
Oil cooler—Ross Heater & Mfg. Co., Inc.
Cooling tower—Diesel Service Co.
Air filters—American Air Filter Co.
Exhaust silencers—Burgess-Manning Co.
Air compressor—Fairbanks, Morse & Co.
Switchboard—Electric Machinery Co.
Pyrometer—Alnor. Illinois Testing Laboratories.
Gauge panels—Fairbanks, Morse & Co.

Each has a multi-point exhaust pyrometer and alarms on jacket water, raw water and lube pressures. The modern switchboard is set flush with the engine room wall and holds such equipment as totalizing kw. hr. meters, kw. meters, engine hour meters, recording kw. demand meters, and overcurrent relays.

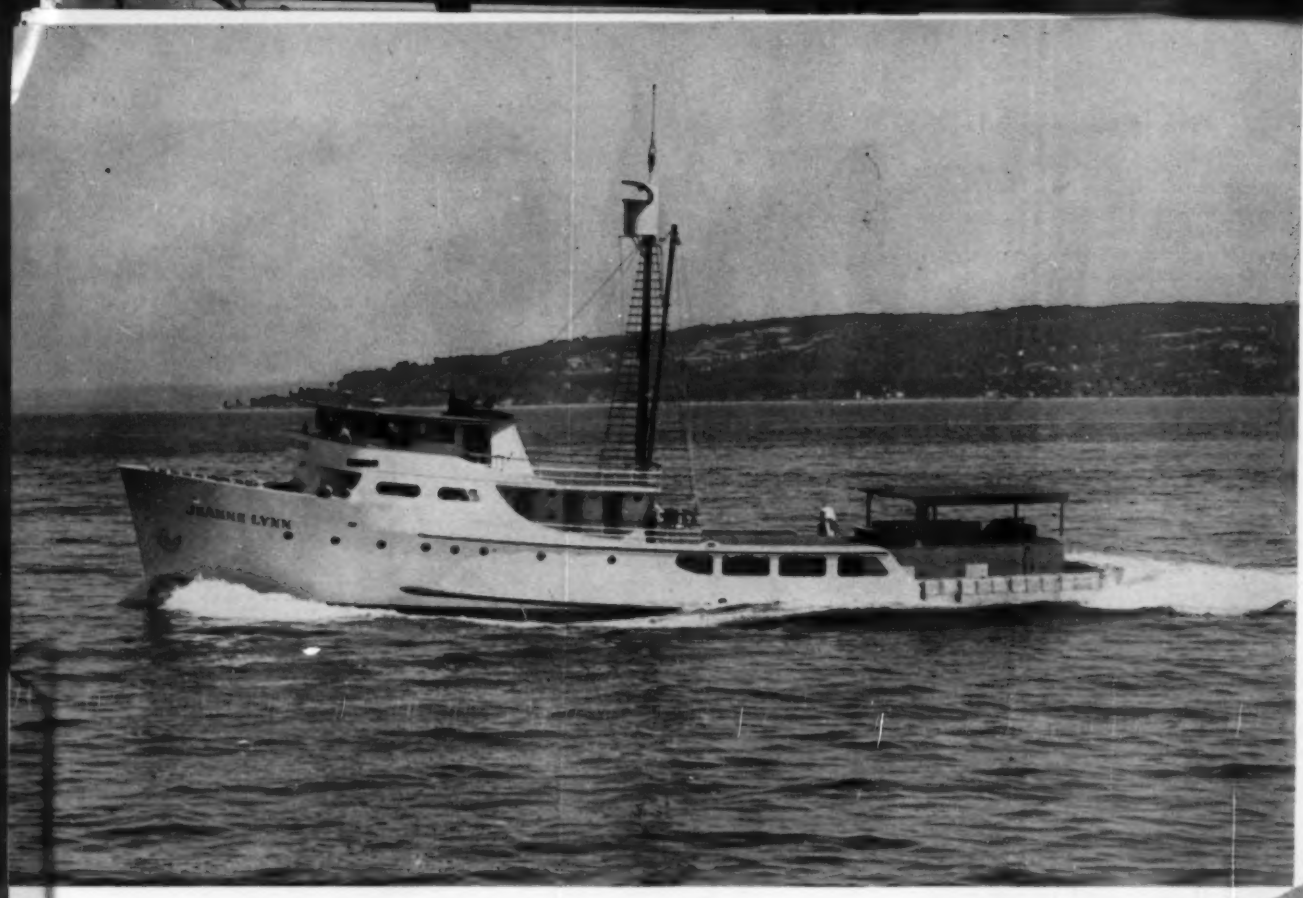
Lakefield is an attractive place to live and its citizens are steadily increasing their use of electric appliances. Though the load is primarily residential, there is some industrial activity. A packing plant which handles chickens, turkeys and other farm products is the largest single customer. In recent years, such public improvements as renovation and expansion of the water system and installation of a new whiteway have been achieved with power plant profits. Today, Lakefield has a fine modern plant, currently profitable, and capable of handling the expanding local demand with increasing efficiency for years to come. The dual-fuel engine, with its 42 percent saving in fuel costs, is playing an essential part in the current successful operations and insures greater profits as the load increases.



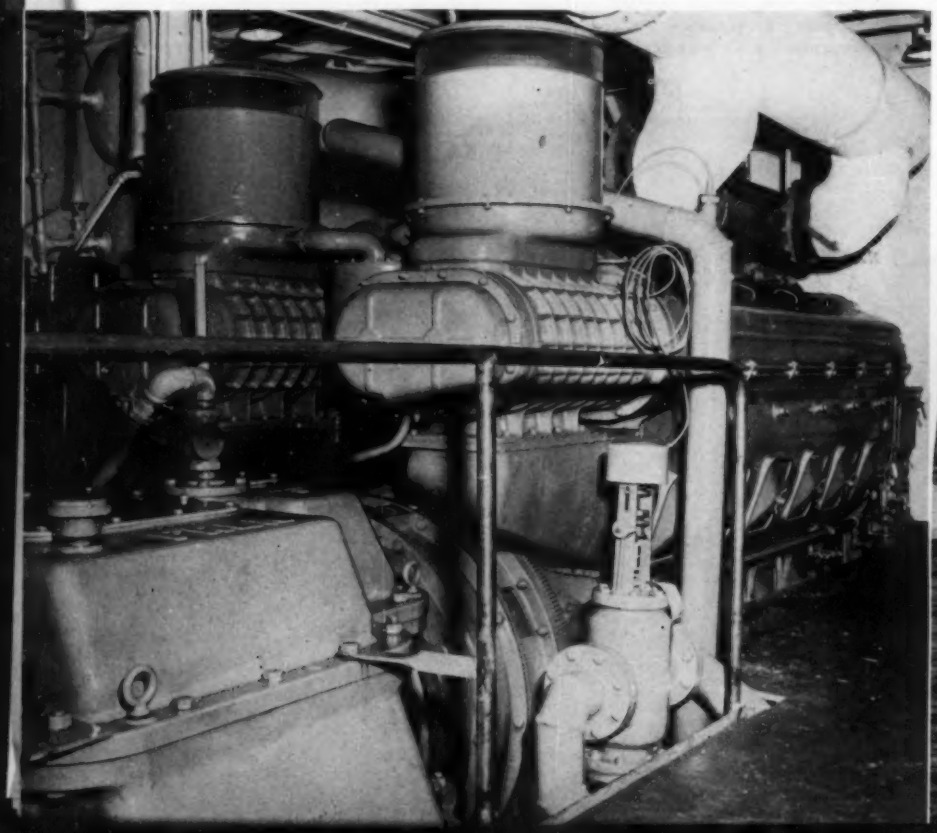
Lube for the plant's biggest engine passes through a Purolator strainer and a Ross oil cooler.



The four F-M engines in the Lakefield plant are, right to left, the 1400 hp. dual-fuel, an 875 hp. Model 33 diesel, a 450 hp. Model 32 diesel and a 225 hp. Model 32.



View of the main General Motors-Cleveland 900 hp. diesel aboard the tuna clipper *Jeanne Lynn*. Note Fulton Sylphon regulator in foreground.



STEEL TUNA CLIPPER "JEANNE LYNN"

Hull By Birchfield — Everything Else By Tacoma Boat!

By CHARLES F. A. MANN

As plans to build several large, highly hush-hush Navy vessels at three Tacoma boat yards that ordinarily, at this time of year are loaded with fishing vessel work, got underway, interesting expedients are resorted to in order to get space for the Navy contracts.

One of the largest tuna clippers completed in the north in 1951 is the big steel clipper *Jeanne Lynn*, delivered early in July to San Diego owners from the busy plant of Tacoma Boatbuilding Co. Inc. at Tacoma. While acquisition of the Pacific Boatbuilding Co. by Tacoma Boat has been complete, in order to rush the regular 1951 production, it was decided to build the hull at Birchfield Boiler shipyard at the port of Tacoma, get it launched quickly and follow the next wood and diesel clipper from Tacoma Boat at the outfitting dock. So, Birchfield built the beautiful, trim welded steel hull, and it was towed to Tacoma Boat where every piece of equipment and every cubic inch of wood was fitted in place and the job delivered on time.

Jeanne Lynn is a trim steel-hulled clipper designed for long-range fishing in Southern waters, with steel tanks, bulkheading and fish wells. It was designed by Tacoma Boatbuilding Co. and has principal dimensions of 122' 3" x 28' x 13' 3", and is owned by a San Diego group headed by Capt. O. W. Martin, formerly owner of the Tuna Clipper *Mermaid*.

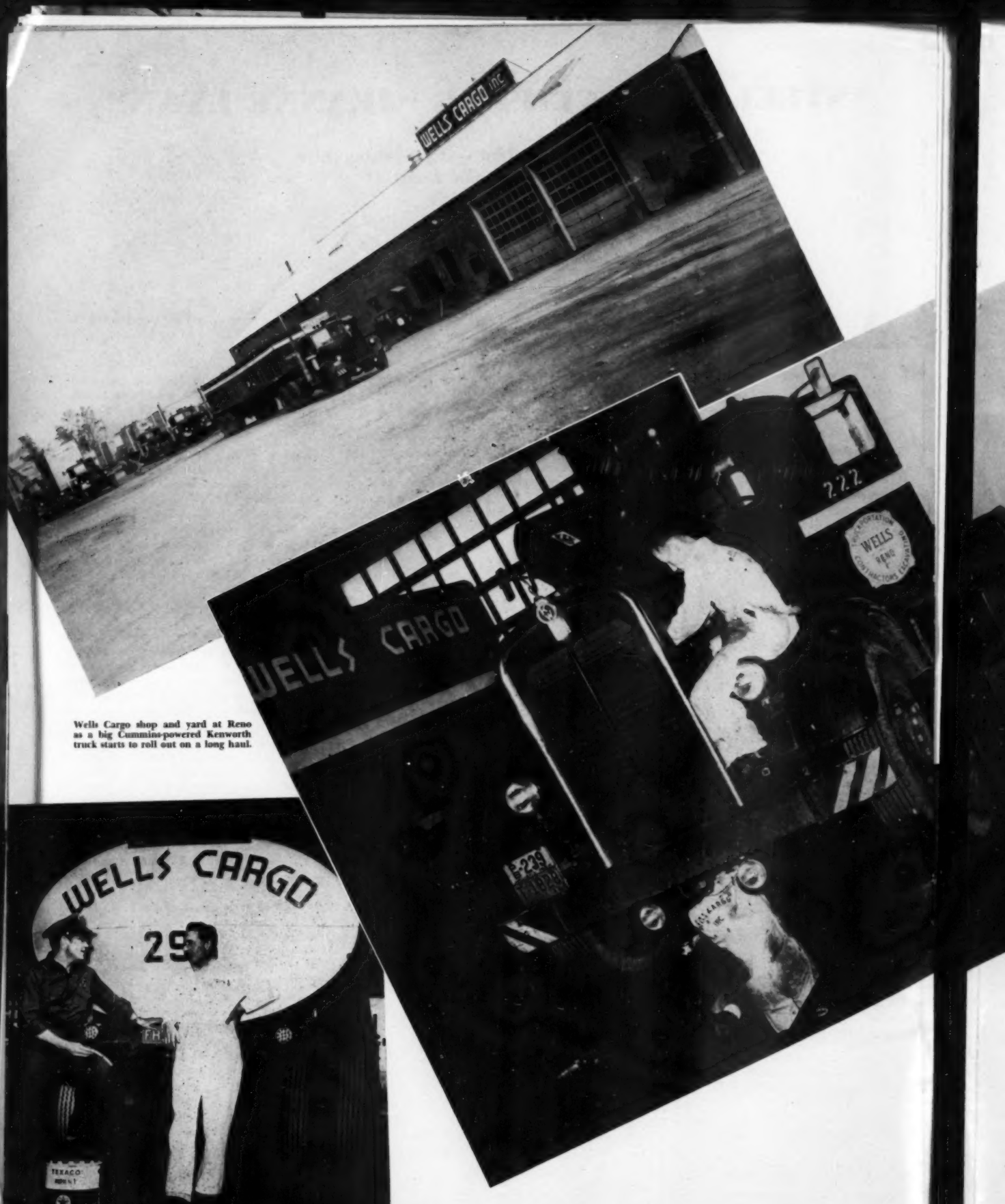
Besides her sweeping lines and large capacity, she is unique in that her power is a 12 cylinder model 567 General Motors two cycle diesel, developing 900 hp. at 750 rpm., and driving a Coolidge propeller, with monel metal tailshaft, through a Falk 2.5 to 1 enclosed reduction gear. This is an offset gear and functions also as a reverse gear that permits rapid maneuvering.

Auxiliary power is supplied by two 8 cylinder model "D" Superior diesels driving 75 kw. Electric Machinery Corporation generators, and a General Motors model 6-71 diesel driving a 60 kw. generator. Deluxe headquarters for 14 men are provided, with the usual beautiful plywood and hardwood installations in the galley and quarters. Tank capacities are for 41,150 gallons of diesel fuel oil; 4,575 gallons of fresh water and 1,200 gallons of lube oil. She packs 245 tons of frozen tuna in 10 main wells and the 3 compartment deck baitbox.

A Wix shell and tube heat exchanger is fitted to the main diesel and the Superior auxiliaries, while a built-in Harrison heat exchanger is fitted to the small GM diesel set, providing full automatic fresh water cooling to all the diesels. Refrigeration machinery consists of two 5½ x 5½ Howe ice machines and a 6½ x 6½ large size Howe unit, and a small 3 x 3 Howe set for the large galley refrigeration load. All compressors are driven by Master motors. The pumping layout consists of twin 10" vertical Fairbanks-Morse bait pumps; 1 Jacuzzi auxiliary 6" bait pump with U. S. Motor; 12 Jacuzzi 3 x 2½ brine circulating pumps each with 2 hp. Master motors; one 4 x 3 Jacuzzi brine transfer pump with 5 hp. Master motor; one Jacuzzi 3 x 2½ bilge pump with Master motor; one Jacuzzi 4 x 3 fire and washdown pump with 7½ hp. Master motor; two Worthington rotary gear oil transfer pumps with Master motors and two De Vilbiss No. 342 air compressors, each driven by 5 hp. Master motors.

Deck and navigation equipment is of the finest, including a photoelectric pilot with Campbell gear drive; 500 watt Pacific Electronics radiophone; Fathometer; Cutler Hammer controls throughout; Flexiphone intercom system; Tacoma Boat's own Northern Line anchor winch, driven by a 10 hp. slipring gearhead Master motor and Northern Line cargo hoist with 10 hp. slipring Master motor with Unibrake.

Jeanne Lynn made a be-yootiful $390,000 picture as she slid down Commencement Bay enroute to her new home port of San Diego.



Wells Cargo shop and yard at Reno as a big Cummins-powered Kenworth truck starts to roll out on a long haul.

"WELLS CARGO" SHOP KEEPS 'EM ROLLING

Finest Diesel Service on 80 Cummins-Powered, Westinghouse-Braked Freighting Trucks Haul Ore and Build Roads in Five States

By F. HAL HIGGINS

Pair of Wells Cargo shop mechanics giving a Cummins-powered Kenworth truck a checking up after a series of long hauls over desert and mountain terrain in handling fast freighting assignment.

THE next world war will throw the heavy freighting business onto fleets of dieselized heavy-duty motor trucks traveling over 12-lane highways at high speed after the home-bred Commies have sabotaged the railroads out of commission for the job. That is the shrewd consensus of some top motor truck transportation and military brass. For that reason, Wells Cargo Co., is getting into road building as a field with plenty of opportunity for the long pull future while leading the pack at freighting the mine ores by truck from much of the big time mining areas of the Rocky Mountain areas. So your O'd Reporter found, on a recent trip into Nevada with calls on, interviews with, and studies of the leading freighting and construction firms with headquarters at Reno. More than a decade of war and post-war preparation for the next probable war has de-emphasized the so-called "precious minerals" while spot-lighting and developing mines for the utility minerals like copper, zinc, lead, magnesium, manganese, etc.

Vice-President H. A. Wells, paused between phone calls from his network of operations over five states and gave details on the growth, rise on diesels, and future plans of Wells Cargo Co., after the visitor had been shown through the Wells Cargo shop that outsiders had pointed to as the finest diesel service shop in the entire mountain area between Sacramento and Omaha. The writer had to admit it was something above and beyond anything he had seen to date, and rated with the best railroad shops that once held the top rating in heavy-duty transportation equipment service. "Our diesel equipment at present is 80 Cummins engines, 8 Murphy diesels in power shovels, 7 Cat motor graders, 1 GMC diesel in a trencher of the Buckeye make, a flock of 8600 and 8800 Caterpillar engines in shovels, etc. We are getting into road building the last year or so, and that brings in more tractors, power shovels for rocky digging, trencher, etc. Why roads? Well, we have to run our big freighting trucks over them so we appreciate good roads, of course. But we—J. W., President, and R. C., Secretary of our Wells Cargo Co., and myself—talked to Kaiser about the big road building future. Kaiser says there will be twelve lanes of the finest hard roads between San Francisco and New York not far off in the future. The top military brass in the Government want it now, but don't dare bring it up for an appropriation because they fear it would get smothered under an avalanche of Me-Too road appropriations for every state in the U. S. But they have decided that the next war will be a motor truck transport job with the rails out of business at the first shot by the Army of Commies inside the U. S. ready with orders to do just that. One big New York banker has been out to look over the question of financing a long tunnel through the Sierras to eliminate that stiff 8-mile climb from Donner Lake to the 8,000-foot pass. He is ready to finance it, but the engineers are still figuring out the disposal of the fumes and gases a 6-lane bumper-to-bumper truck train would create in a tunnel that might be 15 to 30 miles long. Take the hauling of the clothing from the depots at Salt Lake City alone, and it would take every truck in the West to get the clothing out of there and over to the Coast. The freight bill would run $9,000,000 a month, but the trucks couldn't be put out of business like the railroads."

When, why, and how, did the Wells brothers get started? "It was back in 1933," the youthful executive recalled. "We were handling supplies for Johnson Lumber Co., in a trucking contract. Our business was all trucking from the start until after the recent war. We soon started bringing mine timbers into Nevada on the return trip. By 1936, we bought our first diesel, a Cummins. That is the line we have stuck with, until today we have 60 Cummins-powered trucks. With diesels we soon were logging out of Feather River Canyon for the Feather River Lumber Co.

"Then we went into mining about 1937, right on the bottom of the depression. It was strip mining at Virginia City, an open pit gold mine. At the pit we had a Byers 4-yard shovel with Waukesha gas engine, which we soon changed over to a Cummins diesel. A couple of Chevrolet dump trucks completed the equipment there on this gold mining job. Next year, we went out to the Midas to do more strip mining. Here we soon had a contract to haul the concentrates to Selby, down on San Francisco Bay. On this long haul we started using the same Cummins-powered trucks we had started on logging. By the end of 1937, we had the contracts for all the concentrate hauling jobs in this area. We were beginning to use Kenworth trucks with the Cummins engines, of course. It was tough going, but when gold changed by the Government from $20 to $35 an ounce in price, that metal got a big mining lift. There weren't 25 families at Virginia City when the gold standard was changed. Population went up to 5,000 in three or four years. The round trip from Virginia City to the smelter was about 500 miles and required 30 to 33 hours. Finally, came the cyanide operation and concentrate hauling ended. But we continued to haul supplies, machinery, etc.

"On that first job we got to start us off, there were 128 bidders, and we were second. We got the job

when the low bidder proved to be a horse-powered outfit. We were getting ore hauling contracts all over the Idaho-Utah-Nevada map by the time the R.F.C. put $250,000,000 into the magnesium plant at Las Vegas, where we put 24 tractors and 44 trailers and started hauling a 333-mile stretch for a total mileage of 18,000 every day. That was a war job, of course. We had lots of jobs for Anaconda over this war period. With stripping in the picture, we soon accumulated a bunch of shovels. Naturally we went into road building two years ago with all of this tractor and shovel equipment in our set-up, knowing Kaiser from our Las Vegas magnesium job. Kaiser was always in close touch with top thinking in the Washington set-up during the recent war, of course."

A call on the Reno Texaco distributor, who supplies Wells Cargo shop with its line of greases and oils, got the visitor in touch with the shop superintendent who kindly gave us the run of the shop with every consideration in having diesel service experts help get a set of pictures to tell the story of a top diesel service shop that keeps the trucks, shovels and tractors moving on their jobs to prove that good management of skilled labor equipped with the latest diesel tools that are serviced to their top efficiency at all times pays off. It is the combination that built the Wells brothers their Wells Cargo Co. All over the big roomy shop that was laid out, lighted, and air conditioned for high efficiency, were men picking up their morning work when we arrived. Above were hoists to lift, carry, and deposit engines or parts whenever wanted. We spotted a P. & H. "Zip-Lift" just in front of the office door for handling parts or equipment on jobs in that area. For the bigger jobs there were Yale hoists and overhead tracks for moving the heavy engines around to the trucks or stands as needed. Just inside the worker side door entrance was the expert on injection systems and pumps. He was busy servicing a truck injection system. Back of him was the big parts department with any and every part needed to service engines, trucks, tractors, shovels, compressors, Westinghouse air brakes and controls, etc.

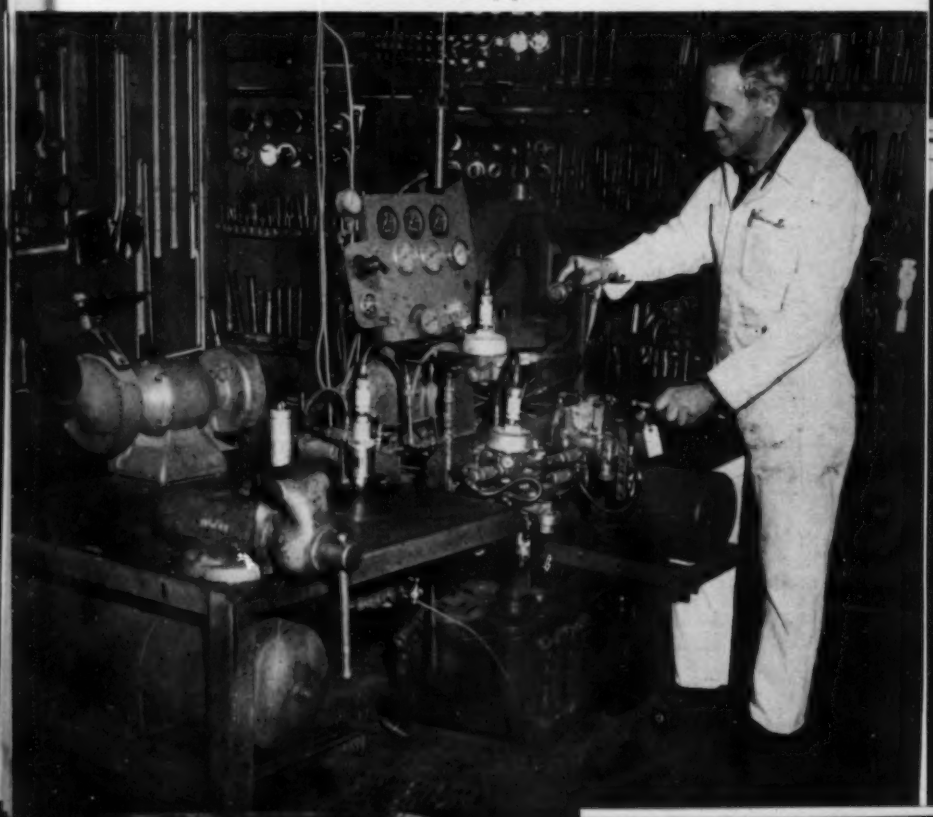
Just in front of the injecting system service stand a few feet away, was a Clayton dynamometer running in a Cummins rebuilt engine to test its efficiency before it went into one of the 80 Cummins-powered trucks in the Wells Cargo string. "We started with Cummins and have stuck with them on performance of engine, service of the manufacturer and dealer, and fitting one make of engine into our shops for minimum of parts, labor and expense," said Mr. Wells.

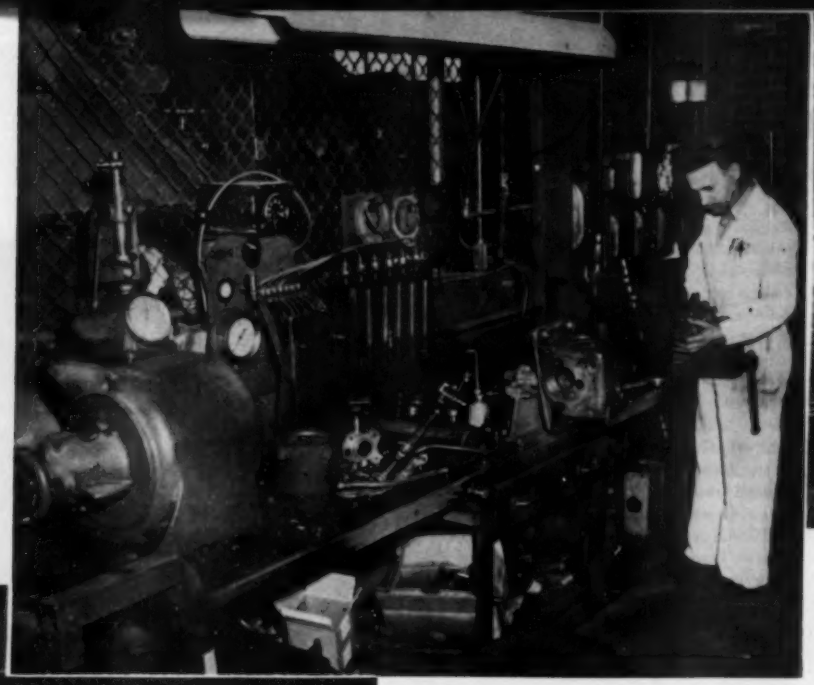
Over in the northwest corner is the high-ceilinged, air-powered paint shop where trucks are painted every so often to keep them looking as well as acting new. Noted the air spraying and pipes and tubes leading back to the center north wall where there are two Ingersoll-Rand air compressors with tanks to supply air power all over the big 300-ft. x 150-ft. shop. Many air tools are used as well as many electric motors built into such installations as hoists. The pit at the east end of the long shop runs almost across the shop to allow pit work on a big truck and trailer without unhitching as it is serviced for a trip with air in tires, water in batteries, lubrication wherever needed, diesel fuel in the engine tank, etc.

Meanwhile, three or four trucks are being worked over by mechanics working in pairs all along the north side of the shop, with the Westinghouse air-brake shop in front of them for special expert service on these $4,000 sets of air brakes and controls of various types on each truck. Imagine an investment of over a quarter million dollars in Westinghouse air brakes and other equipment on a fleet of diesel trucks operated by one firm. Inside the air brake shop, one specialist with special charts and tools is in charge. He has a lathe, and testing table, where every set of Westinghouse equipment is checked and tested and then repaired or adjusted as needed to keep the brakes doing their work.

Pair of Yale hoists used to lift diesel engines in and out of trucks as a shop mechanic starts the day's work.

The Westinghouse room in the Wells Cargo shop is an important and completely equipped department with one skilled air brake equipment mechanic in charge. Each of the 80 diesel trucks in the Wells Cargo stable is equipped with a complete Westinghouse air brake and controls service costing about $4,000 per truck. Here is a Westinghouse unit getting its test to check it before re-installing in a truck being overhauled for brake or other air equipment.





An important spot in the Wells Cargo shop at Reno is this corner where the diesel pumps and injectors are serviced.

Diesel truck and trailer over the long pit that runs the entire length and the width of the Wells Cargo shop as it comes in for service, tires, fuel, water, lubrication, etc.

The equipment was there to make the job easy for men with the service know-how essential on diesel equipped machines. And those men were delivering the know-how with no haste or waste motion. In the little office in the corner of the big parts department, handy for workers on their way to and from the parts department, is the shop superintendent. He is a young fellow, only a notch older than most of the fellows working on engines, with a love of diesels in their heart and a working knowledge of how to doctor sick and worn diesel trucks, tractors, graders, etc., when they come in for surgery, to put them back in top operating efficiency in the shortest time. It's worth a trip to Reno just to look in on a shop like this.

Wells Cargo has gone into road building as a sure long-pull field of profitable operations. Here two mechanics work on the Cummins diesel engine in a Tournapull scraper.

DIESEL TOWBOAT "JOAN E"

By DOUGLAS SHEARING

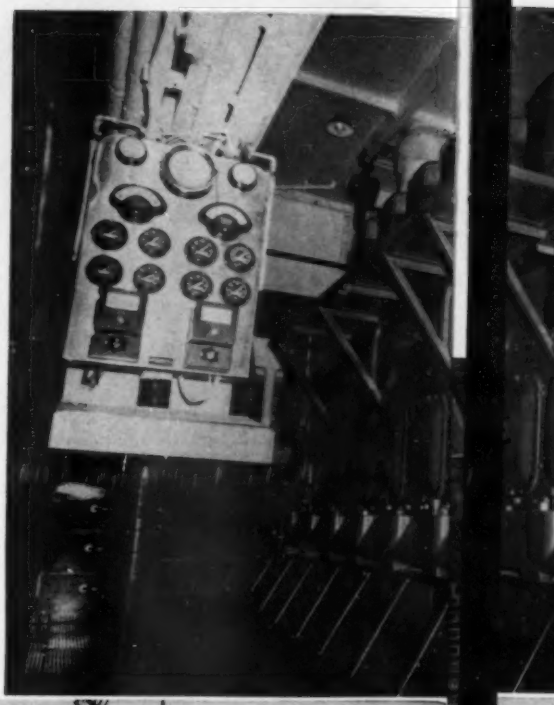
THERE is every reason for Avondale Marine Ways, Inc., to point with pride to the Towboat *Joan E* built for the Texas Towing Co., Inc., of Houston, Texas. A twin screw 125 footer, which is a splendid example of the latest marine design. The *Joan E* was christened on June 9th with formal ceremonies, which were attended by many prominent guests of the Texas Towing Co., Inc., from Houston and Avondale Marine Ways, Inc., and was sponsored by and named for the charming Miss Evelyn Joan Eggers, daughter of Mr. Ernest Eggers, President of the Texas Towing Co., Inc.

The dimensions are length, molded 125-ft.; beam, molded 30-ft.; depth amidships, molded 10-ft. 6-in.; and draft 7-ft. 2 in. Designed for use in the Mississippi River, intracoastal canal and tributary waters service, the hull and superstructure is of very sturdy all-welded steel construction. The hull form is a symmetrical type which will afford maximum towing efficiency incorporating extraordinary strength and rigidity. Propulsion and steering was designed for minimum maintenance, and all construction is in accordance with the requirements of the American Bureau of Shipping for all-welded steel vessels. Design and equipment is also in compliance with the regulations of the U. S. Public Health Service. Primarily, the *Joan E* was designed for high-speed integrated towing and has a towing capacity of 75,000 barrels.

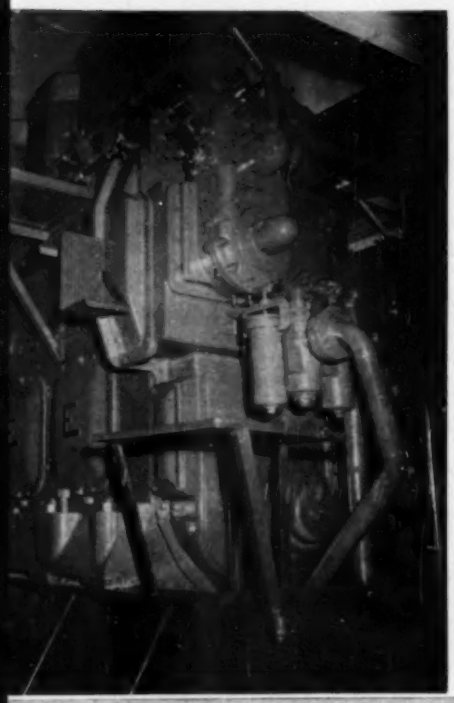
Four towing knees of the double box type construction, each with 15-in. faces and with stout rubber fenders, are installed. Knees are all-welded steel plate with heel braces, and designed for extraordinary towing capacity. Two sea chests with brass strainer plates are built into the hull, one port and one starboard, and cross connected by means of a header. Either sea chest is of sufficient size to supply the full capacity required independently. Coolidge propellers (twin) are of the vanadium steel, size 82-in. dia. x 66-in. pitch. Semi-kort nozzles, fabricated of 1¼-in. abrasion resistant steel plate, are installed over each propeller.

Main propulsion engines, which are pilot house controlled, are two Enterprise model DMQ-316 diesels, (one R.H. and one L.H.), each developing 1250 hp. at 360 rpm. and have a 16-in. bore by 20-in. stroke, direct reversible air starting; 2 Jabsco model "D" circulating water pumps, driven off intermediate shaft, for circulating water through Kingsbury thrusts of main engine; each pump can supply both bearings independently; 1 centrifuge fuel oil system, Sharples model M-97 driven by 1½ hp. motor is used. Fuel and lube oil filters are Briggs units. Six SKF heavy duty roller bearing pillow blocks are used as steady bearings for line shafting. Stern shaft bearings, as well as bottom bearings for steering and flanking rudders, are all Goodrich "Cutless." Top bearings for steering and flanking rudders are SKF spherical roller type.

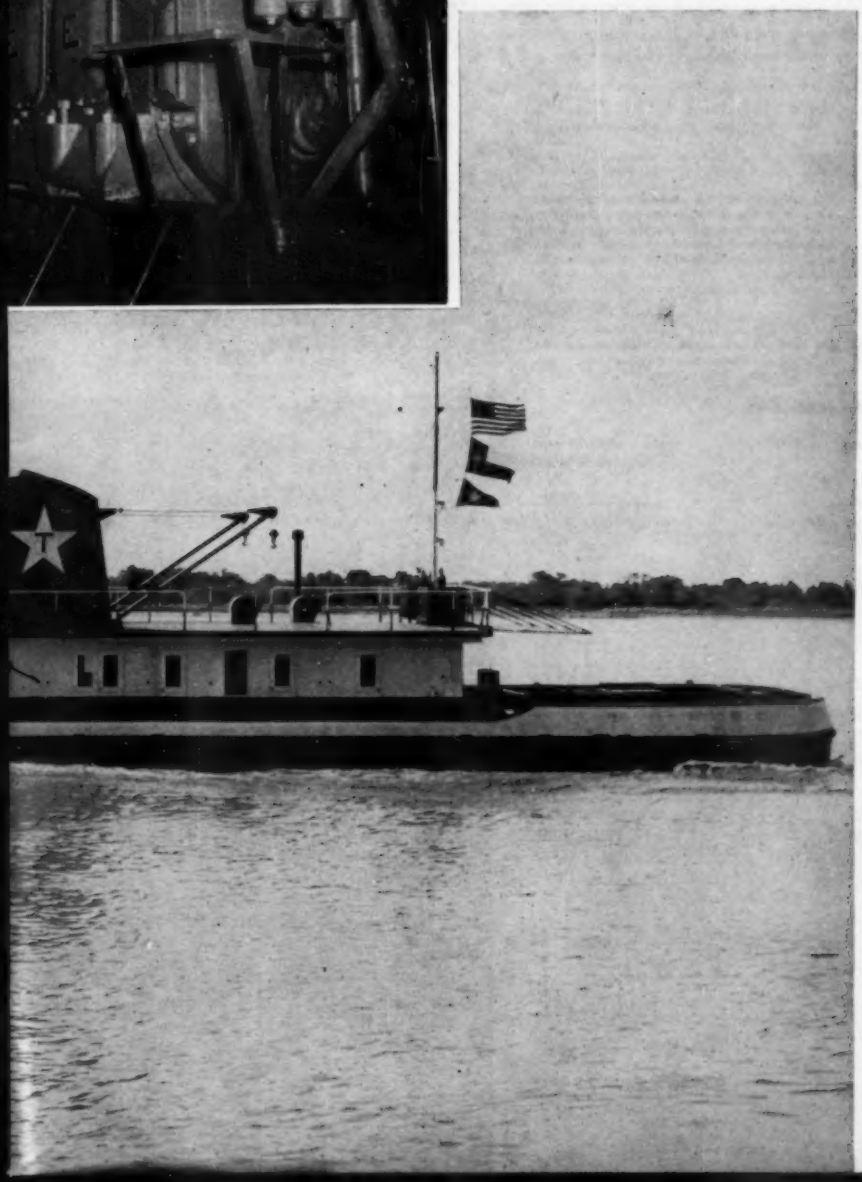
The auxiliary engine equipment comprises 2 General Motors model 4-71 engines with air starters operating 2 dc. 40 kw. generator sets. Steering, through a geared quadrant mechanism, is electro-hydraulic comprising: 2 Vickers hydraulic power units with 2 Vickers fluid motors. Associated equipment is by two 10 hp., 1200 rpm., 115V, dc. motors; 2 Foote Bros. gear speed reducers, with 2 Sperry Rudder Angle Indicators, 2 transmitters, 2 dynamotors and 2 non-follow-up controllers. Air compressors (2) are Gardner-Denver Navy type, each driven by 5 hp. motors. All auxiliaries, pumps, etc., are controlled through central control panel, as well as locally. Units of considerable importance to the *Joan E* are the capstans, which are 2 Stephens-Adamson car puller type driven by Ingersoll-Rand Air motors through a "Morflex" coupling and which were adapted to marine use by Avondale Marine Ways, Inc. Also of equal importance to navigation is the radar equipment which is "Raytheon" and also 2 19-in. Carlisle-Finch (carbon-arc) 10,000 cp. searchlights with vibration dampeners. A third (incandescent) searchlight is a Sperry. A Kahlenberg Triplex T-3 air horn, 8-in., with whistle valve and whistle light is installed.



Superstructure is of steel construction with all exterior bulkheads and overhead areas exposed to the weather suitably insulated against the elements. All windows, except in pilot house front, are steel sash with spring counterbalances, weatherstripped and glazed with double strength glass. Pilot house front windows, which are designed for full fore and aft visibility, are hydraulically operated with push button controls. Interior woodwork in all staterooms and wheelhouse is mahogany and adds considerably to embellishment of finish. Accommodations and furbishing provide extra comfort and convenience for captain and crew and includes owner's stateroom. The general cabin plans consist of captain's room with double bed, built-in wardrobe, dresser, desk, book rack, two chairs and built-in settee. Other officers' rooms are similar to the captain's room. Crews quarters provide equal comfort and facilities and all beds and bunks are provided with individual reading lights. All mattresses and pillows are foam rubber. A standard broadcast radio and television is located in the messroom for entertainment. Pilot house has built-in upholstered settee, pilot stool with back rest, and with log and chart desk.



The usual steering, navigational instruments and main engine controls, etc., are mounted on a specially designed and ornamental console. The engine room is amply ventilated by a 4000 cfm. exhaust fan which is mounted fore and aft in engine room. The quarters are all individually ventilated. An elaborate general alarm system, which is a one-circuit system with switch in the pilot house and with 3 alarm bells, is installed. In general, the M/V *Joan E* represents the latest design in towboat engineering and towing efficiency and was designed and built by Avondale Marine Ways, Inc. The Avondale employees who performed work on the *Joan E* should feel justly proud for the part that they have played in the design and construction of this vessel. However, it is worthy to note that the Avondale Engineer, Eduardo Franzetti, a Naval Architect and graduate of the Naval Academy of Chile, S.A., and also a graduate of the University of Michigan, had complete charge of the design and the preparation of the working drawings of this vessel, and is due a large measure of credit for this fine vessel. The construction of the vessel was under the direction of Edward A. Blanchard, one of Avondale's young builders, who is a graduate of the Louisiana State University, School of Engineering. Mr. Blanchard is also due high praise for his outstanding work in the construction of this vessel. Construction was in cooperation with the Texas Towing Co., Inc., represented locally by R. J. Collie. The *Joan E* will be very prominently identified in marine trade throughout the Mississippi River system, and will serve and maintain the traditions of the Texas Towing Co., Inc., successfully for many years to come.



Capt. Ernest Eggers, President of the Texas Towing Co., Inc., is a man of broad perspective and long range vision, and has developed his company into one of the foremost in the oil transportation industry. The *Joan E* is an outstanding example of the consistent progress made in the past several years. Capt. Eggers, who has had a thorough technical college education in engineering and years of practical experience with diesels enjoys a very genial disposition, but with a determination to carry out a purpose and to get things done. As the result, the Texas Towing Co., Inc., has achieved enviable recognition in the oil industry as a petroleum products towing service, and has always kept abreast of the many requirements of its customers. The *Joan E* with its larger capacities, will augment and materially increase this service.

The Skipper of this new vessel is Capt. C. H. Stringer, who has had years of towboat experience and has been with the company several years; and the Chief Engineer is W. J. Poche, who has been with the Texas Towing Co., Inc., since the inception of the organization.

List of Equipment

Main Engines--Enterprise DMQ-316 Marine Diesel Engines, each 1250 hp. at 360 rpm., 16-inch bore by 20-inch stroke, direct reversible, air starting.
Lube Oil Filters--Type CM Briggs Mfg. Co.
Fuel Oil Filters--Briggs Mfg. Co.
Centrifuge for Fuel--Sharples.
Auxiliary Diesels--General Motors model 4-71, 115 volt, dc. generator sets.
Circulating Water Pumps--Jabsco, model D.

NORDBERG SUPAIRTHERMAL ENGINE

Application of Well-Known Thermodynamic Principle Increases Efficiency of Engine

OUTSTANDING among the advances made in increasing the rating and capacity of modern diesel engines is the introduction of the Supairthermal engine by Nordberg Manufacturing Company. A culmination of six years of research, development and testing, the Supairthermal engine bases its increased efficiency on a well known principle of thermodynamics—the lower the temperature of the air in the cylinder at the time the fuel is injected, the greater the amount of fuel that can be burned, and the higher the horsepower output without increasing peak temperatures or pressures.

The Nordberg Supairthermal engine is available in a complete range of sizes from 425 to 3200 bhp. for stationary and marine applications. The engines are of the four-cycle type and are built for operation on diesel fuel, duafuel and spark-fired gas. The engine's most notable characteristic is its ability, in any given size, to produce one-third more horsepower than the conventional supercharged engine with no greater heat to the cooling water and without increasing the internal surface temperatures or pressures. Although diesel engines are the most efficient means of converting fuel to power, more than 60 per cent of the potential power in the fuel is wasted in the form of heat. A large part of this heat goes out the exhaust pipe and is no problem. Another large portion must be removed from the engine by means of the cooling water and lubricating oil. Most modern diesel engines, although structurally able to yield a greater horsepower, have reached the point where their safe rating is limited by the inability of the surfaces in contact with the combustion gases to continuously stand higher temperatures without heat failure or destruction of piston ring lubrication. Turbocharging four-cycle diesel engine, introduced in America by Nordberg, marked one of the earlier achievements in overcoming these limitations and resulted in increasing ratings 50 per cent.

The next significant advancement made by Nordberg in increasing the capacity of a four-cycle supercharged engine was to cool the intake air after the turbocharger. Intercooling, as it is known, is accomplished with a finned tube type of air to water heat exchanger built into the engine and through which the cooling water is circulated before going to the regular jacket water cooling system. Where cooling water is available at a temperature which will cool the intake manifold air temperature to 90° F., (D.E.M.A. standards provide for rating diesel engines on the basis of 90° F. intake air conditions) intercooling will raise the engine rating about 15 per cent with no greater heat load to the cooling water and with no increase in surface temperature.

The Nordberg Supairthermal engine, latest of the advancements in diesel engine performance, uses the "Miller System of Supercharging" and improves upon the conventional turbocharged engine in four important ways: First, a greater amount of air cool-

Fig. 1, *Supairthermal*—the three pound pressure difference that exists between the input to the turbocharger and the output of the blower provides a high rate of scavenging air flow which removes the exhaust gas and cools the combustion chamber surfaces. Air enters the cylinder at 15 lbs. pressure and 100°F.

Fig. 2, *Conventional*—the 1¼ lbs. pressure difference that exists between the input to the turbocharger and the output of the blower provides only a moderate rate of scavenging air flow.

Fig. 3, *Supairthermal*—the intake valve closes 45° before the end of the stroke. Air inside the cylinder expands from this point to the end of the stroke.

Fig. 4, *Conventional*—the intake valve remains open until the end of the stroke.

Fig. 5, *Supairthermal*—both valves are closed. The air inside the cylinder has expanded to 6 lbs. pressure and 50°F., thereby removing additional heat from the combustion chamber surfaces. Compression begins.

Fig. 6, *Conventional*—both valves are closed. Compression begins.

Fig. 16, Nordberg Supairthermal engine for Foss Lunch & Tug Company's new tug. Engine is rated at 800 hp. at 900 rpm.

NORDBERG SUPAIRTHERMAL ENGINE

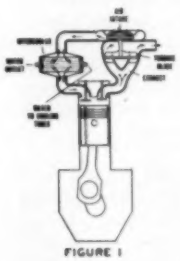


FIGURE 1

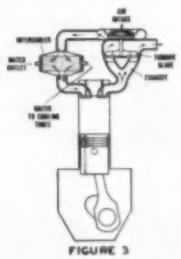


FIGURE 3

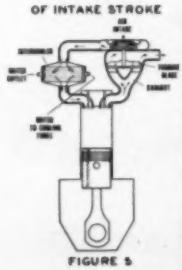


FIGURE 5

CONVENTIONAL SUPERCHARGED ENGINE

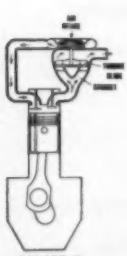
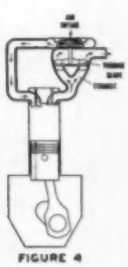


FIGURE 2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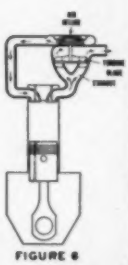
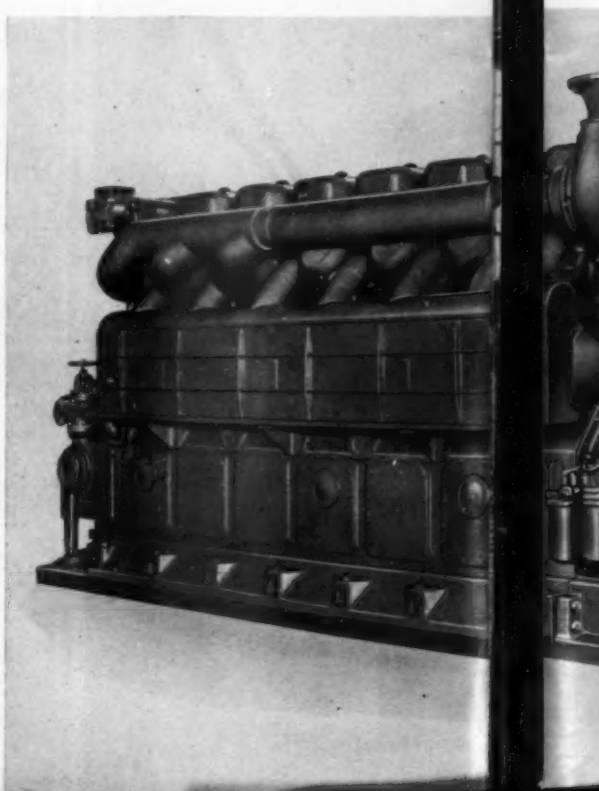


FIGURE 6



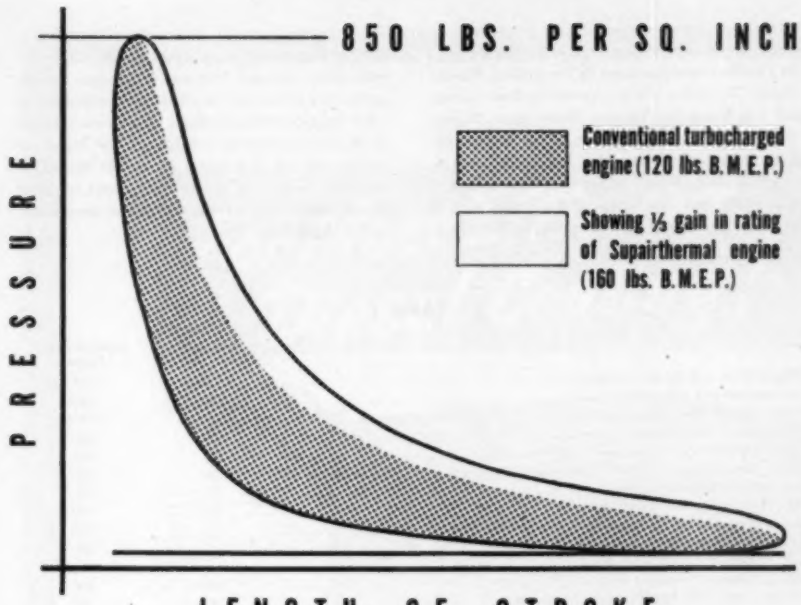


Fig. 7, *Supairthermal*—Combustion chamber contains 30% more weight of air than conventional engine. Temperature is 792° F. and pressure, 648 lbs.

Fig. 8, *Conventional*—Combustion chamber contains air at 1010° F. and 580 lbs pressure.

Fig. 9, *Supairthermal*—Combustion continues until piston has traveled 10% of its stroke. Gas temperature is 3120° F., pressure is 850 lbs. Expansion begins. The increased length of the stroke during which combustion continues in the Supairthermal engine results in the increased B.M.E.P.

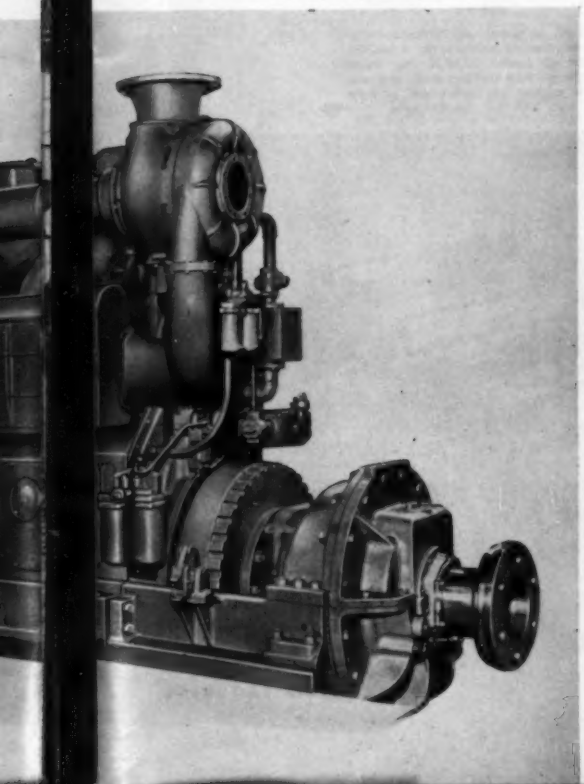
Fig. 10, *Conventional*—Combustion continues until piston has traveled 6.7% of its stroke. Gas temperature is 3390° F., pressure is 850 lb. Expansion begins.

Fig. 11, *Supairthermal*—Exhaust valve opens. Temperature is 1230° F.; Pressure is 62.8 lbs.; Mean Indicated Pressure (M.I.P.) — 187 lbs.; Brake Mean Effective Pressure (B.M.E.P.)—160 lbs.; Mechanical Efficiency—85.5%. Although the total heat dissipated to the water jackets remains the same as in a conventional supercharged engine, the increased horsepower output results in 25% less heat loss to the cooling water per horsepower hour.

Fig. 12, *Conventional*—Exhaust valve opens. Temperature is 1295° F.; pressure is 43.2 lbs.; Mean Indicated Pressure (M.I.P.)—144 lbs.; Brake Mean Effective Pressure (B.M.E.P.)—120 lbs.; Mechanical Efficiency—83.2%.

ing within the cylinder is accomplished by blowing a larger volume of cooler air through the cylinder and out the exhaust pipe. Second, the turbocharger delivers air to the cylinder at a higher pressure, thus providing 30 per cent more weight of air and making it possible to burn more fuel. Third, by means of an intercooler on the discharge side of the turbocharger, the temperature of the intake air is cooled before it enters the cylinder. Fourth, by closing the intake valve before the end of the intake stroke, the air within the cylinder is expanded from 15 lbs. pressure to 6 lbs. pressure, at full load and the intake air is thereby cooled another 50° F.

The turbocharger used with the Supairthermal engine is driven by the exhaust gas and requires no power from the engine. At rated full load, it delivers air to the intercooler at 15 lbs. pressure. Because of this compression within the turbocharger (from atmospheric pressure to 15 lbs. pressure), the air temperature increases about 160° F. But the intercooler cools the air to within 10° F. of the cooling water temperature. With 90° F. cooling water, the air enters the engine cylinders at 15 lbs. pressure and 100° F. The point at which the intake valve closes during the intake stroke is automatically controlled by the pressure in the intake air manifold. For example, with a 15 lb. manifold pressure, which is normal at full rated load, the intake valve closes 45° before the end of the intake stroke. This is an important difference between the Supairthermal cycle and that of the conventional supercharged engine where the intake valve remains open until the end of the intake stroke. The air in the cylinder is expanded from 15 lbs. pressure to 6 lbs. pressure as the piston continues downward to the end of the stroke. Because of this expansion, the temperature drops from 100° F. to 50° F. As the manifold pressure decreases at part



NORDBERG SUPAIRTHERMAL ENGINE

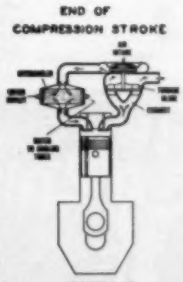


FIGURE 7

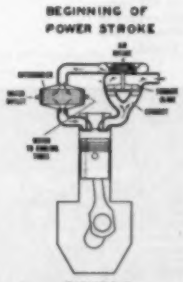


FIGURE 9

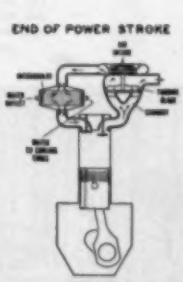


FIGURE 11

CONVENTIONAL SUPERCHARGED ENGINE

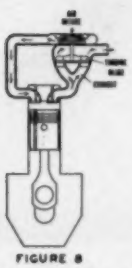


FIGURE 8

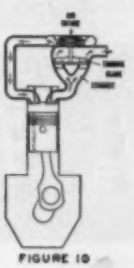


FIGURE 10


FIGURE 12

loads, the intake valve closes later so that the air pressure at the beginning of the compression stroke remains 6 lbs. At light loads where the intake manifold pressure is 6 lbs. or less, the closing of the intake valve is fully retarded and the pressure and temperature at the beginning of the compression stroke is the same as in the intake manifold after the intercooler.

With the increase in power, the Supairthermal engine has greater thermal efficiency, more power in less space, more horsepower per gallon of fuel, more horsepower hours per gallon of lubricating oil, less weight per horsepower, less heat loss to the water jackets and will cost less per horsepower for engine installation, operation and maintenance. The illustrated comparison (Figures 1 through 12) of the various stages in the intake, compression and power strokes of the Supairthermal engine and the conventional supercharged engine clearly shows the way in which the Supairthermal engine increases engine output.

Table 1 gives comparative data on a per cylinder basis for Nordberg four-cycle, 13" bore, 16½" stroke, conventional turbosupercharged and Supairthermal Diesel engines. The indicator diagram is a measure of the changes in pressure and volume within the cylinders of the conventional turbocharged engine and the Supairthermal engine. The dotted area shows the amount of work being done by each piston in the conventional turbocharged engine. The white area shows the increase in the amount of work done by each piston in the Supairthermal engine, which results in an increase of ⅓ in the B.M.E.P. rating.

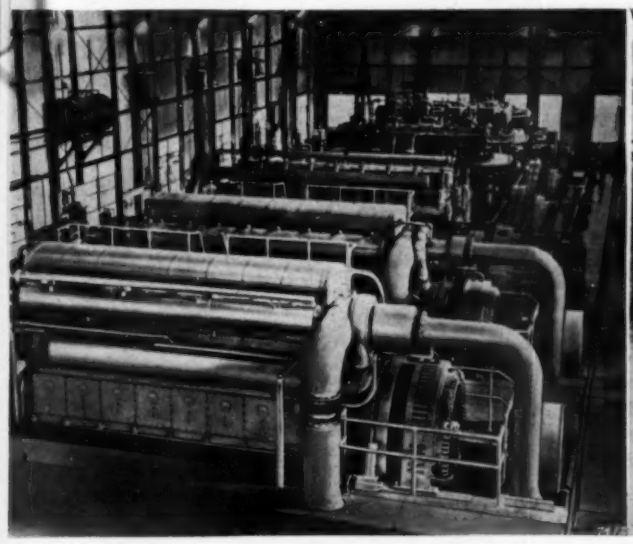
Typical applications of Nordberg four-cycle Supairthermal engines are installations at Nederlandsche Indishe Gas Maatschappen, a public utility on the island of Aruba, N.W.I. (Figure 14); the Florida Power Company in Fernandina, Florida (Figure 15) and a new tug owned by Foss Launch and Tug Company, Tacoma, Washington (Figure 16). At Aruba, three Nordberg Supairthermal engines are in operation and a fourth unit is now being installed. These engines have eight cylinders of 13" bore and 16½" stroke and are rated at 1400 hp., 1000 kw., at 450 rpm. The Supairthermal engine at Fernandina is an eight-cylinder, 16" x 22" unit which develops 2100 hp. at 327 rpm. It supplements a previously installed conventional turbosupercharged Nordberg diesel of the same size and speed rated at 1425 hp. Foss Launch and Tug Company's new tug is powered by an 800 hp., eight-cylinder, 13" x 16½" direct drive, direct reversing Supairthermal engine, that develops its rated horsepower at 500 rpm.

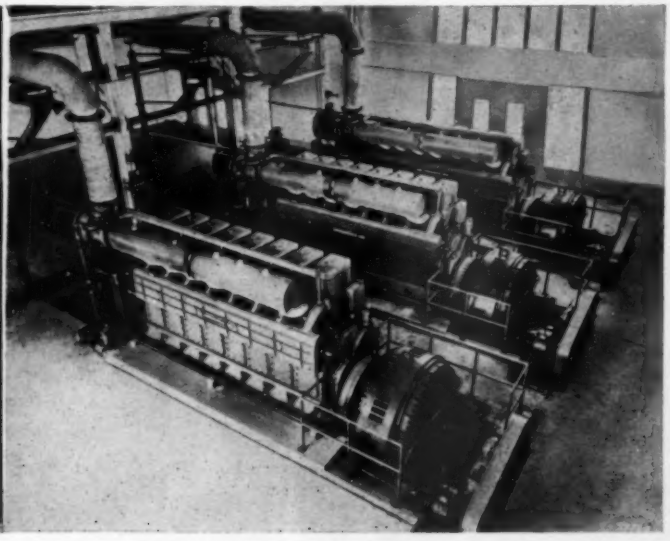
TABLE I

	Low Pressure Supercharged (Non-intercooled)	Supairthermal Engine
Engine Bore and Stroke (inches)	13 x 16½	13x16½
Revolutions per minute	450	450
Piston Speed (feet per minute)	1237.5	1237.5
Maximum firing pressure (psig)	850	850
Brake horsepower for continuous service	150	200
Brake mean effective pressure (psi)	120	160
Ambient temperature (°F)	90	90
Air temperature at supercharger discharge (°F)	142	250
Air temperature to intercooler (°F)	.....	250
Water temperature to intercooler (°F)	.....	90
Air temperature after intercooler (°F)	.....	100
Air temperature entering engine (°F)	142	100
Air temperature at beginning of compression (°F)	142	50
Air Pressure at supercharger discharge (psig)	4	15
Air Pressure entering engine (psig)	4	15
Air Pressure at beginning of compression (psig)	4	6
Heat to cooling water		
Btu/minute per Brake Horsepower	16.20	12.15
Total Btu/minute at above rating	2430	2430
Heat to lubricating oil		
Btu/minute per Brake Horsepower	6.66	5.80
Total Btu/minute at above rating	1000	1160
Heat removed by intercooler		
Btu/minute per Brake Horsepower	.....	8.2
Total Btu/minute at above rating	.....	1645
Typical Comparable Fuel Consumption Rates on Dynamometer test Pounds/BHP/HR		
Full Load	.375	.369
¾ Load	.37	.355
½ Load	.375	.365
Mechanical Efficiency at full load (%)	83.2	85.4

Fig. 15, rated at 2100 hp. at 327 rpm., this Nordberg Supairthermal engine is operated by the Florida Power Company at Fernandina, Florida.

Fig. 14, installed at Nederlandsche Indishe Gas Maatschappen, a public utility at Aruba, N.W.I., are three Nordberg Supairthermal engines. These engines are each rated at 1400 hp., 1000 kw., at 450 rpm.





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CONDUCTED BY R. L. GREGORY

MARSHALL, MICHIGAN

THE demand for increased electric power created by the expanding program of industrial production to meet the national emergency, has promised some difficulties to many municipal plants throughout the country. However, such is not the case at Marshall, Michigan. This situation is due largely to the foresightedness of the city fathers, and Supt. E. A. Angley, and the cooperation of the citizens of Marshall.

Located in the south central part of the state, on the banks of the Kalamazoo river, the Municipal Power Plant had its beginning as a hydro generating plant, using the available water of the Kalamazoo to drive three small hydro generators two of which are shown in Fig. 1. These units consisted of one Allis Chalmers generator of 219 kva. capacity, 3 phase, 60 cycle, 80 percent power factor, generating at 2300 volts, driven by an Allis Chalmers water wheel, a second unit being a General Electric generator, rated at 144 kw., 3 phase, 60 cycle, 80 percent power factor and generating at 2300 volts, also driven by an Allis Chalmers water turbine. The third unit is an exact duplicate of the second, all operated under a 12 foot head. These units are still in operation with the exception of unit No. 2, and carry about 300 kw. of the plant load when water conditions on the Kalamazoo are at their best. With the expansion in diesels, hydro unit No. 2 was abandoned, thus allowing more water for the remaining two units.

As industry began to develop in Marshall, the citizens realized that their power facilities were inadequate to meet the demand, so in the early twenties, a private utility reached an agreement with the city to take on the industrial load, leaving the commercial and domestic load to the municipal plant. However, since the latter load demand was on the increase, the city fathers decided in favor of expanding the plant facilities by adding two diesel units to the plant generating equipment. In 1922, two Nordberg air injection units, rated at 550 bhp., 360 kw., 3 phase, 60 cycle, 80 percent power factor, 2300 volts were installed. This practically doubled the capacity of the plant.

But the city was growing, and it was soon found that further expansion was desirable, so in 1934 a Nordberg, Type TA unit, of the air injection type, rated at 1250 bhp., 860 kw., 3 phase, 60 cycle, 80 percent power factor and generating at 2300 volts was installed. After the depression Marshall enjoyed further growth, both industrially and domestically, and while the private utility continued to care for energy for industrial expansion, it was deemed advisable to look to the future by adding another diesel unit to the equipment at the Municipal plant. This brought up the usual discussion between two factions of the citizens, the one feeling that additional equipment was not necessary, as adequate capacity was available, and the more foresighted citizens who felt that the Municipal plant equipment should be added to, in order to keep ahead of any demand upon the plant with the largest unit out of service.

The latter faction proved their point and in 1939, the fourth unit was added to the plant equipment. This consisted of a Nordberg air injection unit, rated at 1500 bhp., 1050 kw. capacity, 3 phase, 60 cycle, 80 percent power factor, but generating at 4160 volts. In addition to this unit, a contract was given the private utility to provide 200 kw. of standby power for emergency use. This contract was negotiated in 1940. This equipment sufficed during World War 2, although the demand on the plant during that period was rather high. After the war, when plant equipment was more easily obtained, the city fathers decided on further plant expansion and a revamping of the electrical equipment and distribution systems. The first move in this program was the purchase and installation of a Nordberg solid injection unit, rated at 2400 bhp., 1690 kw., 3 phase, 60 cycle, 80 percent power factor and also generating at 4160 volts. This unit is equipped with a separate scavenging blower, motor driven, the starting excitation of which is furnished by a battery of storage batteries. This gave the plant a rated capacity of approximately 4650 kw., or a firm capacity of 2960 kw., with the largest unit out of service. The peak periods of the plant run around 2100 kw., so that the plant is in fine shape to meet any demands made upon it. This does not include the 200 kw. standby service available from the private utility, and since this contract for standby power is about to expire, the feeling is that this standby power will no longer be necessary.

The next step in the revamping of the plant was to change the No. 4 diesel over from air injection to a solid injection unit, and this has produced better efficiency of this unit, thus justifying the expenditure involved in the change. Figure No. 1 shows the original three diesel units as installed. On the gallery at the rear of this picture can be seen the original generating and distribution panels, which became outmoded, and it was de-

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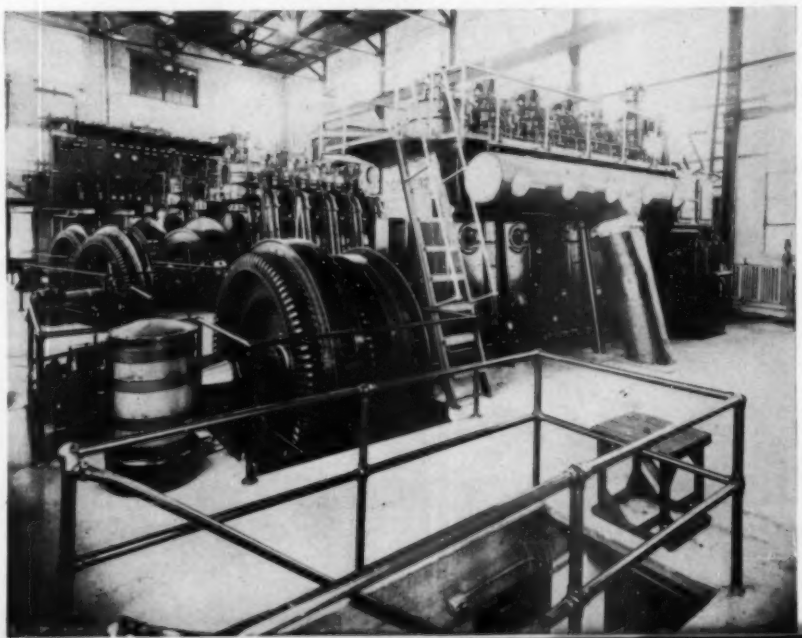
Fig. 1 shows the first Nordberg air injection unit in foreground and two of the older units in the background.



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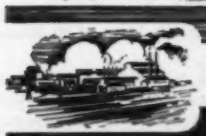

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WHAT'S GOING ON IN ENGLAND

CONDUCTED BY **HAMISH FERGUSON**

Hamish Ferguson was appointed Secretary to the Diesel Engine Users Association in London in 1944. Previously senior technical assistant to Diesel and Insurance Consultants, London, and for several years with English Electric Company in the designing and erection of large diesel generating plants. Mr. Ferguson continues to do independent consulting work.

Rolls-Royce Develops Diesel For Earth-Moving Equipment

IT IS well known that Great Britain has been largely dependent on the U.S.A. for most of its earth-moving equipment. Several years ago, the decision was taken by the Rolls-Royce Company that they would design, develop and market an oil engine suitable for this class of work. The nature of the duty these engines are asked to fulfil places a premium on their efficiency, economy and reliability, and the experience built up by the Rolls-Royce Company would enable them to maintain their reputation in this field.

Intensive development has been carried on, commencing with special single-cylinder units. 15,000 to 20,000 engine hours have been accumulated on the test bed, and many hundreds of hours in vehicles. A number of engines have been fitted to Vickers V.R. 180 crawler tractors and have carried out intensive work on various kinds of sites. In addition, one machine is now operating in Tripolitania under maximum conditions of temperature and sand. The range of engines to be produced is intended to carry all forms of earth-moving equipment—such as crawler tractors, dumpers, power scrapers and graders; all types of oil-field equipment within its horsepower range—examples of which are mobile oil-drilling rigs, pumps and generators and large specialized wheeled vehicles especially suited for export. It is also intended that these engines shall be adapted for marine use. The following is a typical specification of the new engine:

Type—4-stroke, direct injection, liquil cooled overhead valve, supercharged.

Number of cylinders—6.

Bore—5¼ in. (130.175 mm.)

Stroke—6 in. (152.4 mm.)

Capacity (swept volume)—742.64 cu. in. (12.17 litres)

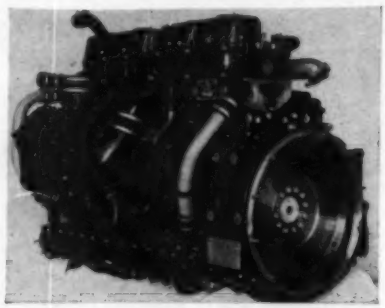
Governed R.P.M.—1,800.

Firing Order—1, 4, 2, 6, 3, 5.

Net Dry Weight—2480 lb.

Brake Horsepower—190 at 1,800 r.p.m.

Torque—600 lb. ft.



A Rolls-Royce C.6. S.F.L. supercharged oil engine for production of Vickers VR. 180 tractors.

Clutch—18 in. dry single plate.

Main Bearings—Copper lead indium pre-finished.

Crankshaft Damper—Viscous silicone.

Lubrication—Full pressure, dry sump.

Fuel System—Unit pump.

Supercharger—Positive displacement.

Starter Motor—Axial type, 24 volt.

Generator—5½ in. dia. 24 volt.

When a high power/weight ratio is required, the main casings are of light alloy, but in "off-the-road" application weight saving is usually of no advantage, and ferrous materials are used. The crankcase, which may be of light alloy or of a special grade of cast iron, is designed so that the wheelcase and flywheel housing can be fitted to either end. By this means the exhaust system, supercharger, and other externally mounted units can be fitted on either side of the engine for "handling" as previously mentioned, without any alteration to the fully machined crankcase casting. This enables the engine to be offset to either side of the chassis and facilitates servicing by permitting easier access to filters and other servicing points grouped together on one side. The main bearings are of the pre-finished steel backed shell type. The cylinder block is integral with the crankcase and is fitted with easily replaceable "wet" liners. Press fit replaceable valve seats are used in the cylinder head.

The seven bearing crankshaft is nitride hardened and has at the front end an externally mounted viscous type torsion damper, which effectively reduces the oscillations and vibrations of the crankcase over the full running range. The light alloy pistons are fitted with three compression and one oil scraper ring and are recessed in the crown to form a toroidal combustion chamber. The overhead valves are operated by push rods, there being one inlet and one exhaust valve to each cylinder. When space is limited, a supercharger can be fitted to give the required power with minimum bulk. The supercharger is of the positive displacement type, mounted on the crankcase and driven by a gear train and spring drive from the timing gears at approximately twice crankshaft speed; this gives about 8 psi boost at the maximum governed speed of 1800 rpm.

The choice of dry or wet sump lubrication is available. Normally the wet sump system is supplied, but if use on uneven ground is anticipated, for example in tractors used for earth clearing, the dry sump system is recommended. Whilst water can be used for engine cooling, it is recommended that a correctly inhibited anti-freeze mixture is used all the year round, as this not only provides protection against frost but prevents corrosion of the coolant passages. Alternative types of single and multiple air cleaner unit have been developed for this engine by Rolls-Royce to ensure the highest practicable degree of air filtration.

High utilization by operators and minimum upkeep costs have been very carefully considered in the design. A major factor in meeting these requirements is the use of common parts throughout the range, made possible by varying the number of cylinders while maintaining the same bore and stroke. Common parts used include pistons and piston rings, cylinder liners, valves, valve rockers, connecting rods, main bearings, and almost all the parts subject to wear, or normally renewed during servicing.

PRACTICAL PREVENTIVE MAINTENANCE PROGRAM FOR DIESELS AND GAS DIESELS

By J. H. CALDWELL*

OPERATORS of diesel engines often look to the engine builder for information and guidance in preparing their maintenance schedules. This is particularly true with new engines and new installations with which the competent operators have not yet become familiar. Although the engine builder realizes the necessity and importance of helping the operator, this obligation presents a very difficult problem. This is true because the type of service in the different installations varies so much that it is difficult to recommend a maintenance program flexible enough to fit all of them. Therefore, in the past the operator, to a certain degree, has been left on his own.

In addition to the above problem, the rapidly increasing rate of engine production has resulted in another difficulty; it has caused an acute scarcity of trained personnel. Therefore, it has been increasingly important for the purchasers of engines and the engine builders to cooperate in formulating a maintenance program that will enable them to realize maximum life from engines and at the same time train personnel in engine "know-how."

In this article we will attempt to outline a program which it is hoped will assist in eliminating the above problems. The entire article is built around the following three points which will be used in an effort to sell the idea of practical preventive maintenance: (1) Why maintenance is more important today; (2) Other maintenance programs and their disadvantages; (3) A practical preventive maintenance program for installations.

1. *Why maintenance is more important today.*—The successful operation of engines always has and always will depend upon at least four things: (1) The design must be right. (2) Correct materials have to be used in order to realize success from a good design. (3) The assembly, both in the shop and in the field, must be completed without error. (4) The engine must be maintained properly. In the past the four "musts" as listed above have had an equal amount of importance in the successful operation of engines. However, we would like to convince engine people that in regard to the modern engine something has happened to upset that equality of importance, and now maintenance plays a much more vital part in the successful operation of engines. Now, as to the reasoning behind the above statement, it is conceded that in the past few years the strides toward increased horsepower output have been amazing. Design and metallurgy have progressed by leaps and bounds to such a great extent that we are able to realize this phenomenal increase in horsepower output and with a great reduction in fuel economy. At the same time it is known that this modern high output engine is very capable of as trouble-free service as the engine of the past. On the other hand it is significant that any malfunctioning of key parts of this engine such as rings, bearings, etc. tends to lead the engine to destruction faster than the older, slower type speed engines. As an example, the piston rings on the older type engine could be permitted to blowby for a long time without overhaul and, in general, the engine could be run in bad condition for longer periods of time than the modern type engine. Therefore, in order to realize success much more emphasis will have to be placed on maintenance than has been in the past. This means that the operator of today will have to be more vigilant and will have to keep ahead of his engines. In addition, engine builders will have to devote more time to customers' particular applications and vice-versa so that better cooperation will be realized.

2. *Other Maintenance Programs and Their Disadvantages:*—(a) That form of maintenance in which the operator runs the engine to complete destruction before exercising any maintenance or adjustments. All will agree that this is absurd, but it is an actual fact that engines are receiving such treatment today. It is only for that reason that we mention it, plus the fact that we will use it as a point in selling the idea of preventive maintenance later in this article.

(b) Progressive Maintenance. It can best be explained by the following example. Assume that it has been determined by past experience that an eight-cylinder engine should be overhauled every 8000 hours. The operator starts out by first stocking a complete sub-assembly unit; that is, cylinder head assembled, piston, rod with bearings, etc. After the engine has operated 1000 hours, then No. 1 cylinder is completely dismantled and the spare unit is taken from the stockroom and installed. The engine is then started and, while running, the unit that was withdrawn is cleaned and thoroughly inspected for cracks or any signs of failure. At the end of the next 1000 hours, the No. 2 cylinder is completely dismantled and the unit that was cleaned is installed. The assembly from cylinder No. 2 is then cleaned and inspected and set aside until the next thousand hours. The program is then completed until at the end of 8000 hours all units have been overhauled. The advantage of this type of maintenance is that the maximum availability of the engine is realized, but the disadvantages far overshadow this advantage. In the first place, it is very costly because you do not obtain the maximum life out of the parts. For instance, if the piston rings are sluggish and it is felt the tension is not sufficient or near comparable to a new ring, the rings are thrown away. It is worth mentioning at this time that piston rings should never be removed from the piston, and if they are, they should be destroyed and new ones installed. Another disadvantage to this type of maintenance is that there is always one unit which is not mated in. It is a known fact that parts do not reach their maximum efficiency until they have been run together for a number of hours so, in the case of piston rings, one cylinder would always be using an excessive amount of lubricating oil. However, the serious drawback with this program is that it does not guard against serious casualties caused by premature failure of some vital part.

(c) Periodic Inspection Maintenance. In this type the assemblies constituting the engine are torn down, inspected, and cleaned after they have been run a specified number of hours. Although it has its advantages and is used extensively by some competent operators, it has many drawbacks. The first of these is needless disassembly of the vital parts of the engine. Removal and replacement of parts still in excellent condition, no matter how carefully done, frequently induces trouble. Perhaps this is caused by simply disturbing parts which have found their optimum running fit or finish. Furthermore, in tearing down assemblies on the engine, dirt is introduced during the operation. This is true even in the cleanest of installations. Likewise, in any engine during operation there is always an accumulation of carbon and dirt which collects in places where it is not doing any harm. However, in tearing into the assembly, this harmless dirt and carbon is moved to a place where it can do damage.

In setting up the inspection periods, the specified hours between them has been determined by an average established by engine builder's test or past performance. However, some small part deep down in the assembly might fail due to material weakness or previous faulty assembly. Failure of this small part leads to premature casualty for the entire assembly, so in this type of maintenance the operator is not free from disastrous casualties because, regardless of the amount of experience both the engine builder and operator has had with the engine, no one can predict how long a particular assembly is going to last. This type of maintenance is also very costly as it takes a large amount of materials such as gaskets and, as in the case of progressive maintenance, the parts do not reach their maximum life. The amount of labor involved in carrying out this type of maintenance also increases the cost. The claim is made that with this type of maintenance anyone without engine experience can disassemble and assemble an engine. Therefore, the labor can be done by low cost personnel, leaving the important inspections to the supervisor. This, they claim, eliminates the problem of training. To the writer this is a step in the wrong direction because any savings resulting from not training personnel, even down to the oiler, is false security. The big disadvantage of the above-men-

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tioned programs is that they lack flexibility in that the engine builder cannot adopt any one as standard and recommend it to all customers. Therefore, the engine builder, of all people, is left without any plan of maintenance.

3. *Practical Preventive Maintenance Program For All Installations*:—The ideal program would have everything that the previous mentioned ones lack, plus their advantages, which brings us to the main part of this article. In discussing the other forms of maintenance, two basic facts are brought out: (1) Certain vital parts last longer and operate better if not frequently taken apart. (2) Operation until complete destruction is foolish and costly.

The above two facts represent the extremities of the situation. It is definitely poor policy to be constantly tearing the engine down for inspection; however, on the other hand, we cannot go to complete destruction before exercising some form of maintenance and adjustment. Inasmuch as maintenance is the most important factor in successful operation, an answer has to be found. In that regard, thousands upon thousands of hours of operation have proven to us that 99% of all failures are preceded by certain signs or conditions. This basic fact gives us a clue to the answer, which is Practical Preventive Maintenance. This is a program whereby a series of very simple tests and observations are used to determine the condition of vital parts before they are taken apart or fail. One of the advantages is that it reduces to a minimum forced interruptions of service experienced in the other types of maintenance. It avoids unnecessary dismantling of the engine and, above all, is very economical in that maximum life of all the parts is realized. It also has the advantage over the other forms of maintenance as it lessens the chances for major casualties. All that is required in this type of maintenance are a few simple instruments which already are available in most installations. However, the key to the whole program is a daily log on important events. From that log, indicators, or let's call them pointers, are taken which are used in determining the condition of the engine. They are guides in determining the exact time that the engine should be overhauled or adjusted. Knowing the condition of the engine, serious engine casualties can be eliminated. The pointers are many and can be explained by referring to Figure 1, which is a recommended log of events. It will be noted that this log is divided into two parts. The lower half is used for recording values of tests such as compression pressures, clearances, etc. Included are several daily checks which are not recorded but should be observed. The various tests are listed in periods at which they should be taken. However, the period at which each is taken is only a recommendation and the operator might want to change the frequency of the test to suit operating conditions and available personnel. It is possible that experience might indicate a necessary change.

Like all log sheets, the figures are there, but trends and signs of distress are hidden. It is like being unable to see the trees for the forest. Therefore, the key to this program is the top half of the log, that is, a series of curves which give the picture at a glance. The horizontal part is in time, such as days. The vertical part is used for the values of the tests. The upper left hand curve is labeled compression pressure. The readings here have been taken every thirty (30) days, and if the piston rings remain in good condition, this curve will be flat until the engine begins to approach the time for overhaul, at which time the curve will start to fall off. This then gives the operator an idea of ring condition. However, if, for example, conditions were not normal, the engine is headed for premature failure after only 120 days operation as noted by a decided compression pressure drop indicated by the dotted line. This would allow the operator to know that either the rings were beginning to wear or stick, or valves were not functioning, or a liner was beginning to score. Any change in the curve will indicate immediate attention is required. However, this one indicator or pointer is not the only one which will reveal the above symptoms of distress, so, before any action is taken, a quick study of the other curves will either confirm or deny the above conditions.

The curve immediately below that of the compression pressure is for lubricating oil consumption, in brake horsepower hours per gallon. The consumption is figured every thirty days and plotted as shown. As in the case of the compression pressure, it will have the flat characteristic as long as the piston rings are sealing properly. This is particularly true with both the oil and compression rings, because if either fail to function properly, high lubricating oil consumption will result. This curve will have that flat characteristic until the rings begin to lose their life. At that point the curve will drop and eventually fall off to a point where it will be uneconomical to operate the engine without a re-ring job. It is significant to note that the downward trend in this curve begins at exactly the same time as the drop off in the compression pressure curve. This would confirm the fact that the rings are causing the low compression pressure. However, let us refer back to the example where a premature failure took place at 120 days as noted by the drop in compression pressure, indicated by the dotted line. If the rings in any one of the cylinders begin to stick or scuff, then a decided drop in lubricating oil consumption (BHP per gallon) will be noticed as shown by the dotted line in the lubricating oil consumption curve.

These two drops in the curves exactly at 120 days confirms the fact that the cylinder in question will have to be pulled because any further operation will result in a serious casualty.

Now, let us say for example that a decided drop was noticed in the compression pressure curve, but the lube oil consumption curve did not indicate a sudden drop, then the operator would know that compression rings were not the reason for the lowering of compression pressure but it would be very evident that valves were sticking or leaking very badly. Again, referring to the drop off in compression pressures at 120 days, the operator can also determine the cause of it by removing the crankcase doors and turning the engine over on air. If the rings are bad a decided hissing noise will be heard in the crankcase. It will also be possible to pick out the cylinder that caused the drop in compression pressure. However, if the noise in the crankcase is normal, then the operator will know that the low compression pressure is caused by valves functioning improperly.

The lower lefthand curve, crankcase pressure, is also an indicator of ring condition. As long as everything is normal, this curve will be flat; however, it is natural that as the engine approaches the overhaul period, blowby will increase which then will result in higher crankcase pressure as noticed by the rise. It will be noticed that this curve starts to rise at exactly the same time as the lubricating oil consumption and compression pressure curves begin to drop, which again verifies the fact the ring job is necessary. Again, referring back to the case of premature failure as noted by the dotted lines at 120 days, there will be a very sudden increase in crankcase pressure at that time if any one cylinder fails to seal.

The fuel oil consumption curve shown in the upper right-hand corner is another indicator of general engine condition, particularly the fuel system and rings. However, the operators should be cautioned not to use this curve for determining condition of the fuel system, because the nozzle can begin to function improperly without much advance notice and if allowed to operate in that condition, serious damage will result. The color of the exhaust stack gases is the best indicator of fuel oil system conditions and corrective measures can be taken immediately.

Th curve showing pressure drop across the lube oil filter illustrated in the middle right hand side of the chart is not only very interesting but affords a great deal of information. This will be borne out in the explanation. This curve applies only to those filter installations that are full flow; that is, the type of filter through which all lubricating oil is passed. When the filter cartridges are cleaned, it will be noted that at zero days the pressure drop is only about six pounds. Each succeeding week, as noted by the small dots in the curve, the pressure drop increases until at the end of approximately fifty days the pressure drop reaches the maximum specified by the filter manufacturer which, in this case, was 22 pounds. At that point the cartridges are becoming clogged and will not pass sufficient lubricating oil; therefore, the filter had to be changed, which brought the pressure drop back to the original figure of six pounds as noted by the first arrow above the note "filter change." The pressure drop readings were then taken each week until the maximum specified figure was reached after the next fifty days, and at that time the cartridges were changed again which brought the drop back to six pounds. Therefore, this curve is a very good check as to the condition of the lubricating oil filter cartridges, which will allow the operator to obtain the maximum life from them without overcontaminating the lubricating oil. Thus the lubricating oil is always in the best of condition and yet all the available life has been realized from the elements. This point cannot be overemphasized because clean lubricating oil is very essential in successful operation.

Another important point revealed by this curve is that it will indicate to the operator if any dilution is present. It will be noted that after 280 days the pressure drop was slightly below eleven pounds:

after the 290 day reading, or after an elapse of ten days, the pressure drop was still eleven pounds. Under normal conditions the curve would have the rising characteristic but the lubricating oil became diluted and reduced the viscosity of the oil to such an extent that even with more contaminated cartridges, the pressure drop did not rise over the ten day period. This indicates that dilution was present. Once noticing this dilution, the operator should immediately find the leak and correct it before any serious damage occurs.

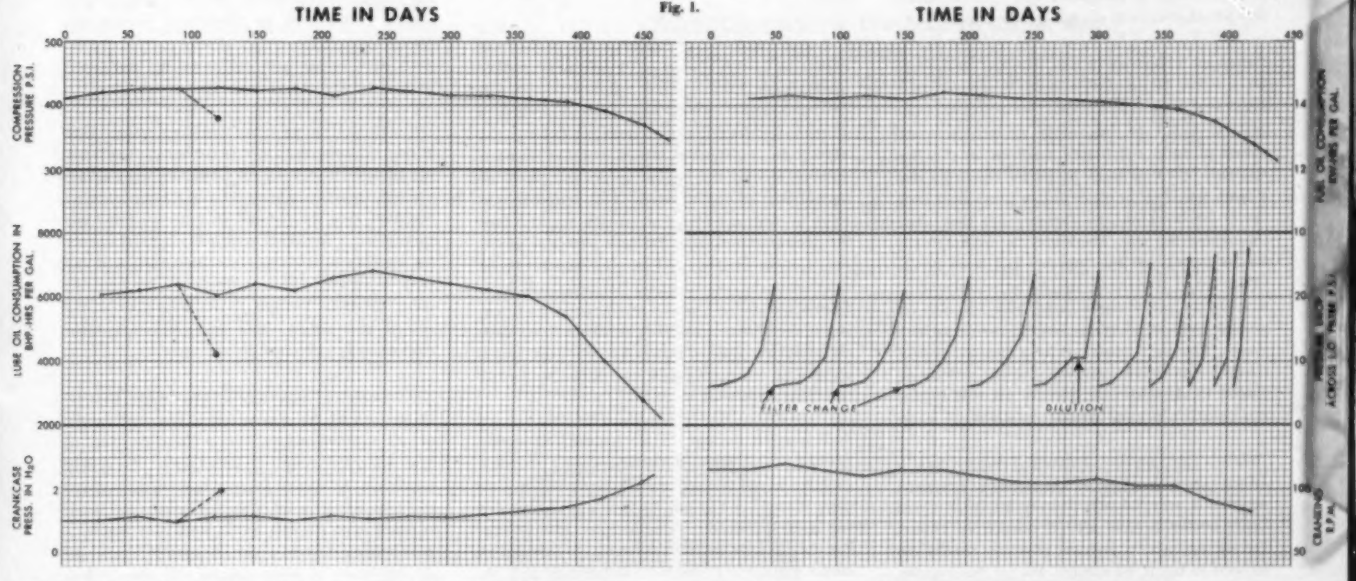
This curve will also bring out another important indication; it will reflect general overhaul engine condition. Every engine accumulates or manufactures dirt or carbon at a certain rate, likewise, the filter cartridges will remove dirt at a certain rate; therefore, under normal conditions it will be noted that in the beginning the life of the cartridges was about fifty days before reaching the specified maximum pressure drop. However, after the engine begins to blowby and approach the period of necessary overhaul, the dirt rate of the engine increases. Inasmuch as the cartridges will remove dirt at a specified rate, then the life between changes is reduced considerably towards the approach of overhaul. This is noticed by the fact that after 300 days, the cartridge life between each succeeding filter change became less each time until at the 405 day period the engine was manufacturing dirt at such a fast rate that the cartridge life was only in the neighborhood of 12 days.

Cranking rpm of the engine has been plotted in the lower righthand corner. This test should be made each time with the air tanks charged to the same pressure and when the engine is warm. The curve indicates condition of several parts before failure actually occurs. If starting valves are beginning to act sluggish, the cranking rpm will be less, which means the air starting system needs immediate attention. It might be a simple thing like dirt in one of the valves or moisture in the system. Nevertheless, the indicator has told the operator of this condition. Too often an engine has been allowed to reach that situation and when it is badly needed it won't start. A drop in rpm also indicates possible misalignment of the engine. Lacquer on pistons or bearings will cause a decrease in cranking speed.

The explanation of the above pointers has been long and, in getting into the details, we probably have forgotten by now the main idea of practical preventive maintenance, so it might be well to review it at this time. In carrying out the above inspection and using the pointers, it will be noted that no major assemblies have been dismantled to this point. Nevertheless, one will agree that by now we have a very good idea of the condition of the engine. This knowledge has been received without any forced interruptions and any dismantling of the engine, which experience has shown does decrease life of actual parts. The possibility of faulty reassembly and getting dirt into the engine has been eliminated. Likewise, we have not used any parts up to this time, staying ahead of the engine and receiving maximum life out of the parts.

It might be a good idea before proceeding to the remaining pointers as shown on the log, to say something about how the tests should be conducted. It should be remembered that in doing this work we are not attempting to reach Utopia in regard to engine adjustments, nor are we attempt-

Fig. 1.



REMARKS ON DAILY READINGS

IF ANY CHANGES ARE NOTED IN FOLLOWING READINGS INCLUDE THE REMARKS BELOW: 1—EXHAUST TEMP., 2—PRE-TURBO TEMP., 3—WATER TEMP. TO & FROM ENGINE 4—LUBE OIL TEMP. TO & FROM COOLER, 5—LUBE OIL PRESS. 6—AMT. VAPOR FROM CRANK CASE BREATHER, 7—COLOR OF EXHAUST, 8—SOUND OF ENGINE

ENGINE MAINTENANCE LOG FOR

.....COMPANY.....STATION UNIT NO.....

WEEKLY READINGS

DATE	PRESSURE DROP ACROSS L.O. FILTER	AIR INTLD PRESSURE	CRANK CASE PRESSURE	CHECK FOR LEAKS	DATE	PRESSURE DROP ACROSS L.O. FILTER	AIR INTLD PRESSURE	CRANK CASE PRESSURE	CHECK FOR LEAKS
9	10	11	12	13	9'	10'	11'	12'	13'

MONTHLY READINGS

DATE	COMPRESSION PRESSURES 1	2	3	4	5	6	7	8	VALVE SUPPLY CLEARANCE	L.O. DRP MIN. PSI GAL	HOURS OPERATED THIS MONTH	TOTAL HOURS	CRANK ING R.P.M.	SEND L.O. SAMPLE	CHECK SAFETY DEVICES	DRAIN CRANK CASE FROM F.O. & AIR LEAKS	F.O. CONSUMPTION FROM MTR. GAL	REMARKS
14				15					16	17	18	19	20	21	22	23	24	

SEMI-ANNUAL READINGS

DATE	ROD BEARING CLEARANCES 1	2	3	4	5	6	7	8	CRANK WEB DEFLECTIONS 1	2	3	4	5	6	7	8	CRANK SHAFT THRUST	CRANK CASE INSPECTION	CHECK CRANK FIGHT. NUTS	CHECK F.O. & VALVE TIMING	REMARKS
				25									26				27	28	29	30	

ing to duplicate values as meticulously determined in laboratory tests during development of engines. In that regard actual values of the test mean little to us here but the important thing that we are looking for are any changes in the values. In taking the readings it is only essential to take all the tests under the same conditions each time they are recorded. Take for instance, the compression pressure test. This should be done at the most convenient condition. In the case of powerhouse engines, that probably would be at no load and full rpm when the engine is off the board. It might also be a good idea to take the readings as soon as possible after the engine has been taken off the line, when it will be near operating temperatures.

It would be ideal in describing the pointers or indicators to elaborate a little more on each subject, such as dilution, because it is so important; but that would make this article very lengthy and would be digressing from the original intention, to form a practical preventive maintenance schedule. In regard to other indicators listed in the lower half of the log, many are self-explanatory and several already have been covered, so for the sake of brevity the more important ones will be explained. Each indicator is numbered and those numbers will be referred to in explaining the log.

Indicators 1 through 8 are included under the block titled, "Remarks on Daily Readings." Inasmuch as this log covers events over a period of one year, it would be impossible to include actual values of daily and hourly readings on this log; yet, they reflect so much on engine condition that a space has been provided below these eight indicators for notes on any changes that took place throughout the year. Therefore, the ordinary daily log sheets will be kept separate and some of the values taken from them are to be transferred to this engine maintenance log which has the expressed purpose of giving engine condition at a glance. This log is made out for a four-cycle turbocharged engine, but two-cycle engines will be included in the discussion for the sake of making this article a general engine maintenance setup.

Indicator #1, namely, Exhaust Temperatures, is always taken by means of a pyrometer. The pyrometer is a very valuable instrument in detecting faulty nozzles, fuel oil pumps, exhaust valves, etc., but we strongly recommend that they should not be used in balancing engines. We say this because, in the case of four-cycle turbocharged engines, in which the cylinders are exhausting into separate tubes which are of different lengths, it is impossible to have all cylinders recording the same exhaust temperatures even when the engine is in balance. Therefore, the individual fuel oil pumps, as in the case of jerk pumps, or distributing valves in the case of other fuel systems, should be set to deliver exactly equal quantities of fuel. Inasmuch as the quantity of air to each individual cylinder is fixed and no adjustments can be made for it, then equal distribution of the fuel will result in as close a balance as possible.

In the case of two-cycle engines, the pyrometer when used for balancing has resulted in a great deal of trouble. For example, suppose the exhaust temperature of one particular cylinder starts to rise. The operator, thinking this cylinder overloaded, then reduces the amount of fuel to that cylinder. What he does not realize is that the ports are clogging up causing a reduction in air and, therefore, increasing the exhaust temperature without any increase in load. As the ports further clog up in this cylinder he, in various stages, will reduce the amount of fuel to the cylinder until he has removed a great deal of its load and, since the engine is required to carry a rated load, the lack in horsepower has to be carried by the remaining cylinders. Each time the operator reduces the fuel to the cylinder in question, he puts additional load on the remaining cylinders to such an extent that they go to destruction. This has happened many, many times and pistons, rings, cylinders, etc. have been unduly condemned because of this practice.

Indicators 2 to 5 inclusive under "Daily Remarks" are self-explanatory. Indicator #6, namely, Amount of Vapor From Crankcase Breather, is merely a check or confirmation of piston ring condition as indicated by compression pressure, lube oil consumption, and crankcase pressure. Indicator #7, that is, Color of Exhaust, is well understood by all engine operators; therefore, we need not elaborate on it.

Indicator #8, Sound of Engine, is one of the most important in this scheme of "Practical Preventive Maintenance." It has much significance and will eliminate casualties if its importance is stressed to all personnel from the superintendent down to the oiler. Each day someone should spend at least ten minutes around the engine to get the "feel" or normal beat of engine noises. This person should stand by each cylinder and actually try to follow the piston up and down. A tight piston or piston pin, a main or conn rod bearing knock can be detected if the normal sound has previously been determined. A few minutes should be spent listening to the blower, crossheads, auxiliary drive, lube oil pump, etc. Once a person has the "feel" of his engine, he can readily pick out defects by paying this little daily visit.

Indicators 10 through 13 are included as weekly readings. The actual values should be recorded each week, and the date should be written in Column 9 under which are 26 spaces, but since this log is made to cover an entire year, the readings for the last half should be put into the 26 spaces under Column 9 Prime to 13 Prime. Indicator 10; Pressure Drop Across The Lube Oil Filter, has already been described. Air Manifold Pressure (Indicator #11) in the case of four-cycle turbocharged engines will reflect turbocharger conditions, as well as the cleanliness of the air filter. Reductions in this air manifold pressure will result in a dirty exhaust; therefore, its value should be recorded each week. In the case of two-cycle engines, the scavenging air pressure is probably more important because any increase in this pressure will be a certain sign that the ports are beginning to clog. Likewise, a decrease in scavenging air pressure will be caused by faulty suction or discharge scavenging valves as well as a clogged air filter. Crankcase pressure has already been described. Indicator #13; that is, Check for Leaks, cannot be included as an actual value; however, each week a check mark should be placed in that column which indicates that the operator has checked over the engine.

Indicators 15 through 24 inclusive are included in the block for monthly readings. In regard to Indicator 15, enough has already been said about compression pressures; however, as the curve, as previously mentioned, was an average of all cylinders for each particular period, it is important to record in Column 15 the actual compression pressure value for each cylinder.

Indicator #16, Valve Tappet Clearance, should always be maintained as specified by the engine builder. It is not necessary to record the tappet clearance for each valve; however, it is important that they be checked and if found off they should be corrected. When the tappet clearance of all the valves has been checked, a check mark can be placed under Item 16. If an operator discovers that it is necessary to adjust the tappet of any particular valve too often, that should indicate to him that there is some wear taking place in the valve operating mechanism between the camshaft and the tappet. This includes ball and joints, etc. A faulty push rod crosshead bushing can be detected by any change in clearance as well as scuffed cams or rollers. This can all be determined without any dismantling; if the tappet clearance remains constant, then the operator can be assured that everything is satisfactory.

Indicator #17 is used for recording actual value of lube oil consumption in brake horsepower hours per gallon, for plotting the curve as previously explained. In order to keep the curve from changing direction each month and in order to make the curve show a flat characteristic for normal operating conditions, it is important that each time the value is figured, the lubricating oil level in this sump should be brought to the same place at the end of each month. This will give an accurate reading rather than an erratic curve.

The remaining indicators in this block; namely, 18 through 24, have been either described before or are self-explanatory, except Item 21; that is, Send Lube Oil Sample to Laboratory. This is very important. An engine in poor operating condition will soon break the oil down. Likewise, a bad batch of lubricating oil will break down and destroy a good engine in short order. A complete report on the condition of lubricating oil will also confirm the findings of the other indicators included in this log. Although any lab will include remarks in their report, it is advisable for operators to study the booklets distributed by every oil manufacturer in order to familiarize himself with such tests as neutralization number, precipitation number, viscosity, etc.

Indicators 25 through 30 inclusive are included in the block for semi-annual readings. In regard to Indicator 25, Rod Bearing Clearances, the practice of determining this value by use of leads or by means of inspections is not recommended because the bearing has to be dismantled, which is against the policy of preventive maintenance. It is the opinion of the writer that a great deal of bearing failures have been caused by faulty assembly, such as improper entering of dowels, introduction of

dirt, either behind the bearing or on its surface, or by not tightening the bolts correctly. A bearing that is designed properly will not show wear or fatigue over long periods of time when good lubricating oil is used. However, the best mechanics have slipped in the assembly of bearings, particularly in the case of larger engines because it is a very difficult job to actually see how the bearing is being mated when drawing up the cap. Nevertheless, in view of the fact that the bearings are a very critical part of the engine, maintenance has to be practiced. A noticeable drop in lubricating oil pressure gives an indication of excessive main bearing clearances, this is also true to a lesser degree, in the case of connecting rod bearings. In the case of larger engines and thicker bearings, examination of lube oil strainers and filters for foreign material such as babbit, will alert the operator to any bearing failure before damage to the shaft begins. However, the practice of putting a dial indicator on the rod and resting the button against the engine frame or crankshaft and barring the rod up and down, and noting bearing clearances, is a sure indication of bearing condition. Some will argue that this method does not give a true reading of clearance which is true but, even so, this does not make any difference because it is merely a change in reading that is significant. In some cases of bearing fatigue where the metal spalls off and builds up in one spot, the clearance as noted by this method actually will decrease, indicating to the operator that the bearing is in distress. If the reading increases above the normal figure, then the operator will have to dismantle the bearing for inspection. The above method covers connecting rod bearings. In the case of main bearings, taking strain gauge readings at each crank web is a very true means of detecting their condition, and this value should be recorded in Column 26.

The remaining indicators as shown in the semi-annual block are self-explanatory; but, something should be said of crankcase inspection. A very thorough check on the condition of the crankcase has eliminated many a serious casualty. All bolts, nuts, cotter keys, and oil lines should be checked for tightness. The backs of all crank doors should be carefully checked, because if a bushing or bearing has failed, the particles will be thrown out against the door. The bottom of the oil sump in wet sump engines, as well as the dry sump, should be checked for foreign material. A portion of the liner and piston can be checked for scoring by placing the piston at top dead center when inspecting liners, and bottom dead center for inspection of the lower part of the piston skirt. Rods and piston pins can also be checked for discoloration due to heat.

The writer is positive that engine operators could elaborate on this article and add many indicators. Much more could have been said regarding the value of each indicator. In that regard, an entire book could be written about the subject of engine maintenance. Such a book would be valuable to many of the younger operators that we have today who lack valuable experience.

The appearance of the log (Figure 1) and the amount of detail used here in the attempt to sell Practical Preventive Maintenance might give one the impression that it is too complicated for practical use. This is not the case because the readings and checks are simple and can be used to train all personnel in how an engine functions. It can also be used to keep supervisors in the main offices well informed on conditions of the engine, and not as much time will be used as in the case of most maintenance programs with lengthy reports.

Engine Contract Awarded

For power supply in the largest municipal electric plant in the United States, at Freeport, Long Island, Baldwin-Lima-Hamilton Corporation, Hamilton, Ohio, has been awarded a contract for a Hamilton diesel engine of 4350 net brake horsepower. The engine will drive a General Electric generator of 3100 kw. capacity. Installation will be during 1952. The Hamilton engine is a Model 921-SA, a 9-cylinder engine with 21½-inch bore and 27½-inch stroke, running at 257 rpm. It is 2-cycle, port scavenged, with rotary exhaust valves and motor driven centrifugal scavenging blower. The blower motor will be connected across generator leads so that it will start automatically when the engine is started. Burns & McDonnell Engineering Company, Kansas City, Mo., were consultants in the selection of the engine.

DIESEL ENGINE CATALOG has just come off the press in its Sixteenth expanded Edition. Completely revised and re-edited, it is an invaluable aid to design engineers and buyers. ORDER COUPON ON PAGE 22.

Elected Vice President

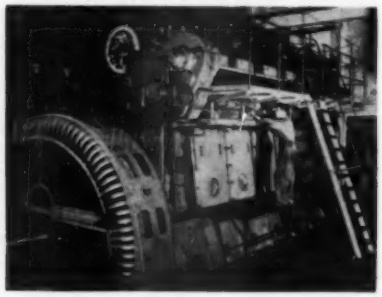
L. F. Shoemaker

Following the meeting of the Board of Directors of The Buda Company, Harvey, Illinois, announcement was made of Mr. L. F. Shoemaker as Vice President of the company. Mr. Shoemaker, or "Shoe" as he is known to his friends, first became associated with The Buda Company 31 years ago in February, 1920. His long career with The Buda Company has included positions in service, new engine field test, retail sales and manufacturers sales departments. He has served many years as Regional representative and in distributor and branch retail sales. For the last 12 years, he has been in the executive sales capacity as Manager of Industrial Engine Sales Division and then as Engine Sales Manager.

Speaks on "Trouble-Shooting"

"There is nothing mysterious or complicated about engine trouble-shooting—its just plain organized thinking." This is what Harold H. Hall, general service manager, Cummins Engine Company, Inc., Columbus, Indiana, emphasized recently in a talk before a Railway Equipment Operation and Maintenance Section, U. S. Army Transportation Corps, at Marietta, Pennsylvania. The Transportation Corps operates a large number of Cummins engines in switching locomotives. The Army men were told that trouble-shooting is defined as "locating the cause of a difficulty in order that permanent repairs can be made." Mr. Hall said that the word "permanent" was included in the definition because of the comparative period of service obtained when repairs are made without locating and correcting the basic cause of the failure. He contended that mechanics do not have to be graduate engineers in order to analyze engine failures. He said, "In the majority of problems the only requirements are a knowledge of the construction of the units and the principles of its operation. Knowing these factors, anyone who is qualified to make repairs on the unit can start at the beginning and follow through on each step in the functioning of each part until the cause of the trouble is found."

On The Line in Six Minutes

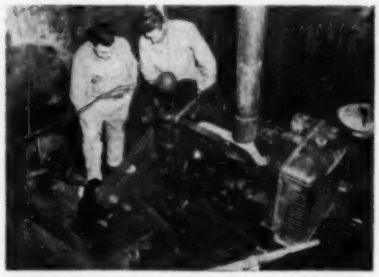


Three 2250 hp. Hamilton diesel engines at the Harwood station of the Minnkota Power Cooperative, Inc., in North Dakota, operating one to four hours per day for peaking purposes, have an average output of 250,000 kwh. per month. It took only six minutes for Mr. Helmer Eraker and his assistants to put all three on the line recently, when the main feeder into the Harwood area was cut by a crop dusting plane. The engines had to pick up a load of 4000 kw. Cost of power was 0.94 cent per kwh. during a recent month. The figure varies somewhat with fuel cost. The plant is used to supplement steam power capacity of 10,000 kw. in the system. Its maximum output for a single month was 1,500,000 kwh. when the plant operated 16 hours a day. Performance and availability of diesel power, as well as the service of the manufacturer, Baldwin-Lima-Hamilton Corporation, Hamilton, Ohio, have been excellent, a company spokesman stated. The power plant is part of a large generation and transmission system serving rural areas in and adjacent to the Red River Valley of the North, and serving 30,000 customers in an area of 40,000 square miles.

Cooper-Bessemer Promotes

The promotion of I. W. Ferguson to manager, quality control, was recently announced by Dr. Hewitt A. Gehres, executive vice president of The Cooper-Bessemer Corporation. "The new post of manager, quality control, is a natural outgrowth in Cooper-Bessemer's continuing effort to improve manufacturing precision," explains Dr. Gehres. "Especially during a period of marked acceleration in production activity, as we are experiencing now, a carefully defined management authority of this kind will enable Cooper-Bessemer to maintain uniform standards of manufacturing quality in its engine and compressor building plants located in Mt. Vernon, Ohio, and Grove City, Pennsylvania." Under the new quality control plan, Mr. Ferguson will report directly to Dr. Gehres. At the same time, E. C. Phelps has been elevated to assistant works manager, formerly held by Mr. Ferguson, according to P. R. Letz, Cooper-Bessemer works manager. Harold Johnson now becomes factory superintendent, and Harry Cecsarini, supervisor of the routing and estimating department.

Diesel Provides Dependable Service



Midland, South Dakota water commissioner Charlie Schofield and Tom Gillaspie inspecting the International UD-6 which pumps all of Midland's water.

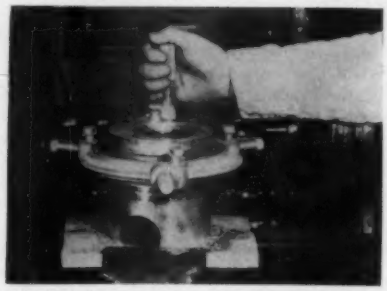
Midland, South Dakota, still finds the town council meeting a good way to thrash out community problems and get things done. When Midland's water supply was in danger, it was the town council, acting as a community sounding board, that made the decision which has benefited the town ever since. When its old pump and pumping engine wore out, Midland had to do something quick to restore its water supply. The selection of new equipment was up to the town council. Someone proposed that the town borrow a high-speed diesel from the town's largest manufacturer, and try it on the pump. Old timers scoffed and said, "Those pee-wee diesels will break down in no-time on a real tough pumping job like we've got here."

That night, an International UD-14 diesel—a much smaller engine than had been used previously—was brought to the pump house, the floor of which is 20 feet below the ground level. As the townspeople gathered for the big test, automobiles were driven up and their lights flooded the area like a traveling circus had come to town. Two councilmen knocked a hole in the pump house wall and ran a long belt from the UD-14 to the old pumping unit. With the headlights gleaming on the shining red paint of the engine, Tom Gillaspie, Town Clerk, stepped up and had the wires from the power line connected to the starter. Then as everyone held his breath, Water Commissioner Charlie Schofield signaled to "turn it over." The big red diesel started to hum immediately. There was only a momentary deep "chug chug" as the diesel took hold and the belt began to move slowly. Soon the belt was singing along and the old pump was putting water up the pipe into the 65,000 gallon hilltop reservoir tank. One of the town councilmen remarked, "Well, I wouldn't have believed it unless I'd seen it. Now if it can only keep running, I think we've got our question answered."

The UD-14 ran not only the rest of the night but pumped all the town's water for the next two weeks, perched in the open, outside the pump house with its long, flat belt disappearing inside. That settled it. The town council voted to buy an International UD-14 with the entire approval of the town as a result of night demonstration.

When the engineers of Empire Equipment Company of Sioux Falls, South Dakota came out to install the engine, they recommended an even smaller unit for the load, the UD-6, much to the astonishment of the town council. Charlie Schofield had his doubts, too, but after what he'd seen, he told them to go ahead. That was four years ago. The UD-6 has been pumping every day since, providing the water which is mighty precious to the people of Midland, out on the prairie.

Piston Regrooving



"Manulathe" in position ready for regrooving operation in research department of Caterpillar Tractor Co.

With material for new machines and replacement parts in short supply, the application of practical methods for prolonging the life of parts to keep machines operating is becoming increasingly important. Many parts, seemingly worn out, must now be salvaged. A conservation program has been in progress at Caterpillar Tractor Co., and one practice which has been encouraged is the regrooving of diesel engine pistons, a job that essentially doubles their life. The point of greatest wear on a piston is the top ring groove, so if the piston is otherwise sound, remachining the groove for a "wide" top ring can give many additional hours of life to the piston. For several years, the economics and practicability of salvaging diesel engine pistons in this manner has been recognized. The regrooving is accomplished either by turning the piston on a very accurate engine lathe, or by performing the job with a precision hand operated tool known as the "Manulathe."

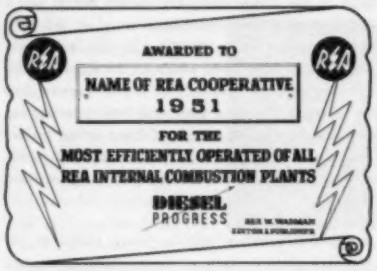
"Wide" piston rings are now available for all Caterpillar diesel engines with the exception of the new high output V-type engines. The factory at this time does not recommend regrooving of pistons for these particular engines. The "Manulathe" provides a very accurate and fast method of regrooving pistons. It will produce results equal to those obtainable on the best engine lathe, and is equally adaptable to all-aluminum as well as cast iron insert type pistons. The tool consists of a cast ring with three locating pins and a carboloy cutting tool. The cutting edge is fed into the work with each revolution of the "Manulathe" about the piston. Since the tool is accurately located on the piston and rate of feed is constant, very precise results are obtained.

Named Division Controller

Martin H. Miller

Martin H. Miller has been named division controller for the National Supply Company's Engine Division according to an announcement made in Springfied, Ohio by Mr. F. H. Kilberry, Division general manager. Mr. Miller joined National Supply in 1934 as a mail boy. He held, successively, the positions of cost clerk, budget supervisor, and plant controller at the Springfield plant. In his new position, he will coordinate all accounting functions of the company's Engine Division.

Annual Award for Efficiency



Above is a black and white reproduction of the bronze plaque which DIESEL PROGRESS will present annually to the most efficiently operated Rural Electrification Plant in the United States using internal combustion engines. The first award will be made on the basis of the plant records for 1951 and will be presented at the next annual conference of operators of REA-financed generating plants. As announced in the report on the second annual conference (DIESEL PROGRESS, August, 1951), an Honor Roll of the ten most efficient plants will be published throughout the year based on monthly reports.

Locomotive Maintenance Officers—Attention!

The 1951 Annual Meeting of the Locomotive Maintenance Officers' Association will take place at the Hotel Sherman, Chicago, Illinois September 17-19, inclusive. Every locomotive maintenance officer in the United States is invited to attend. Exchange of ideas and the discussion of problems is a major factor in efficient and safe operation of equipment. The consolidated thinking of the leading minds in the field will be presented at the meeting. Reports will be made by the several committees covering almost every phase of diesel operation, personnel training, shop practices, shop tools, material reconditioning and control, terminal facilities and diesel electrical equipment. Preconvention presentations have developed new ideas and started many discussions. The discussions will be concluded at this Annual Meeting. Active (Railroad) membership in the Association is $3.00 per year. Associate (Supplymen) membership is $5.00 per year. Those wishing to attend the meeting should mail their checks for membership or renewal to C. M. Lipscomb, Secretary-Treasurer, LMOA, 1721 Parker Street, Little Rock, Arkansas. Reservations should be sent directly to Hotel Sherman, Chicago, Illinois.

Power Plant Expanded

Nebraska's largest municipally owned diesel generating plant is scheduled to grow still larger. The City Council of Sidney, Nebraska has awarded a contract to the Nordberg Manufacturing Company for a 3,440 horsepower dual-fuel engine which will bring rated horsepower capacity of the plant to 8,220. Delivery and installation will be made before winter sets in.

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Supervising and Operating

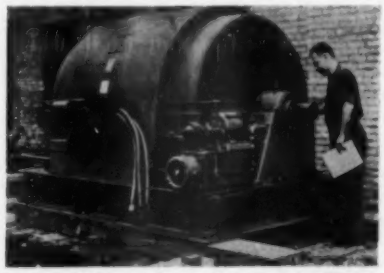
. . . Continued from Page 54 . . .

cided to improve the situation by the installation of a new modern switchboard which was installed in 1949. The switchgear on this board is all of Allis Chalmers make, and are of the cubical type with interchangeable circuit breakers. All units of the board open from the front for accessibility. Circuit breakers are quickly removed, the only work involved being the lowering of the breaker onto a small four wheeled dolly, then withdrawing it from the cubicle. This switch board is a 4160 volt board, with voltage from the 2300 volt generating units being stepped up to 4160 volts by means of a large Allis Chalmers oil cooled transformer located immediately behind the new board. The generating panels of diesels 3, 4 and 5 are coordinated on this board, while those of the hydro units, one old diesel and switches handling the city street lights, water department units and plant power and light remain on the old board in the gallery. This board handles 2300 voltage only. All 4160 volt distribution is handled from the new board.

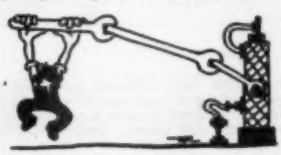
The new switch board features a recording megawatt meter, a recording megavar meter and a recording meter for the excitation voltage on units 3, 4 and 5. The megawatt and megavar meters are made by Leeds and Northrup and the exciter voltage recording meter is a Bristol. The new board is lighted by a series of incandescent luminaires mounted on the ceiling and about ten feet in front of the board. This arrangement provides an even light of the proper intensity on the switch board and operating floor and eliminates glare. All voltage regulation is provided by Allis Chalmers rocking arm type regulators, which are installed on both the new and old boards. The storage battery cells are charged from the line, and beside furnishing excitation for the scavenging blower motor on the No. 5 diesel, they also provide emergency power for switching and control operations and control lighting.

At present another unit is being added to the Marshall plant in their program of expansion and revamping. The old Nordberg units, installed in 1922, have been depreciated and out-lived their usefulness. No. 2 unit has been removed and in its place they are installing one of the new Nordberg radial units, which are becoming so popular with many Municipal plants. They expect to have this additional equipment in operation, sometime in September and the exchange of these two units will add approximately 800 kw. capacity to the plant. This unit also will generate at 4160 volts and will be controlled from the new switchboard.

Big Electric Motors



Eight units like this, the largest electric motors and pumps ever built for oil pipe line pumping service are now being installed by the Texas Pipe Line Company, Houston, Texas, on what is known as the Basin Pipe Line System, for an expansion of the 515 mile, New Mexico to Oklahoma crude oil line. Eight 3000 horsepower, 1780 rpm. induction motors will drive huge centrifugal pumps in four stations of the Jal, New Mexico to Cushing, Oklahoma section of the line. These eight motors, and seven similar 1250 horsepower units will add 100,000 barrels per day to the pumping capacity of the huge pipe line system which delivers crude oil from West Texas and Eastern New Mexico to connecting pipe line carriers at Cushing, Oklahoma, for movement into the Chicago-Great Lakes area. These 3000 horsepower motors use pressure lubricated bearings, and are fully enclosed for ventilation from a filtered fresh air source to minimize fire hazard. Despite their great horsepower, the motors will be started across-the-line at full voltage, and they are designed for specially low starting current to minimize the disturbance to the power systems. The motors were built by Electric Machinery Mfg. Company of Minneapolis 13, Minn.



Form Advisory Committee

Addison F. Vars

A committee has been set up representing a cross section of the country's engine and boat builders to act as an advisory group with the National Production Authority. Anyone in this industry having a production problem or requiring information from the NPA are invited to direct their questions to this committee in care of Addison F. Vars, Chairman, at 1757 K Street, N.W., Washington, D.C. Following is a list of the committee members: Addison F. Vars, Sterling Engine Company, Washington, D.C.; John Trumpy Jr., John Trumpy & Sons, Inc., Annapolis, Md.; John W. Mulford, Gray Marine Motor Co., Detroit, Mich.; Clyde C. Williams, Chrysler Corp., Marine & Industrial Engineering Division, Detroit, Mich.; C. M. Isenhower, The Matthews Company, Port Clinton, Ohio; C. J. Owens, Owens Yacht Company, Baltimore, Md.; W. L. Wheeler, Wheeler Yacht Company, Clason Pt., N.Y.; G. W. Codrington, Cleveland Diesel Engine Division, General Motors Corp., Cleveland, Ohio; Ralph C. Klieforth, Universal Motor Company, Oshkosh, Wisc.; Arthur Gauss, Nevins, City Island, N.Y.; William E. Simms, Simms Bros., Dorchester, Mass.; J. K. Turner, Welin Davit & Boat, Perth Amboy, N.J.; Fred Crebbin III, Steel Craft Boats, Inc., West Haven, Conn.; Frank Denison, Broward Marine, Inc., Fort Lauderdale, Fla.; Joseph Fellows, Fellows & Stewart, Wilmington, Dela.

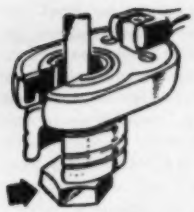
Moves to New Building

Beard & Stone Electric Company have recently moved into their new building located at 3909 Live Oak St., Dallas, Texas. They are distributors for American Bosch and Bendix-Scintilla fuel injection systems. This new plant was especially designed to meet their exact requirements as automotive electrical and equipment distributors. Included in their new building is the diesel injection department comprised of 4 rooms, with a total area of 1070 square feet. The large work shop is central, with the diesel office, stock, and pump cleanup rooms conveniently located on either side. The whole area is completely air conditioned. All injector parts are kept in this department, which includes those for most pumps used in this territory on industrial, farm, and railroad equipment. The repairs and parts are under the supervision of Mr. Richard Giles, who has been with the company since 1929, and received his training at the American Bosch Fuel Injection School at their factory at Springfield, Mass. With the thought of future expansion in mind, ample room has been provided for additional equipment and parts. Also, the bench arrangement in the shop area provides room for small groups of customers' men to visit the shop occasionally for special instructions on their injection equipment. Also, the auditorium is located just above the diesel department, providing seating capacity for larger classes of instruction when necessary.

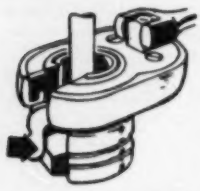
New Brochure on Leece-Neville

A new, 24-page, well illustrated brochure on the company and its products has just been published by The Leece-Neville Co., Cleveland, Ohio, manufacturers of electrical equipment for diesel, gas and gasoline engines. The brochure outlines the part played by Leece-Neville in this field for over forty years. This is followed by pictorial sections on the company's production, assembly, testing and engineering facilities. The balance of the booklet shows typical equipment made by Leece-Neville for buses, trucks, industrial engines, off-highway equipment, passenger cars, rail, marine and aircraft. Included are ac.-dc. alternator systems, generators, starting motors, hand and magnetic switches, and voltage regulators. The brochure carries the title "At your service . . . Leece-Neville." The company states that copies will be sent to interested persons writing on their company letterhead to Leece-Neville Co., Cleveland 14, Ohio.

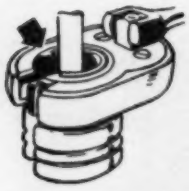
Something New In Wrenches



With the open-ends of the TAC ratcheting head and socket aligned, any center standing part does not interfere with its operation.



The socket, dropped on the fitting, fits with close tolerances.



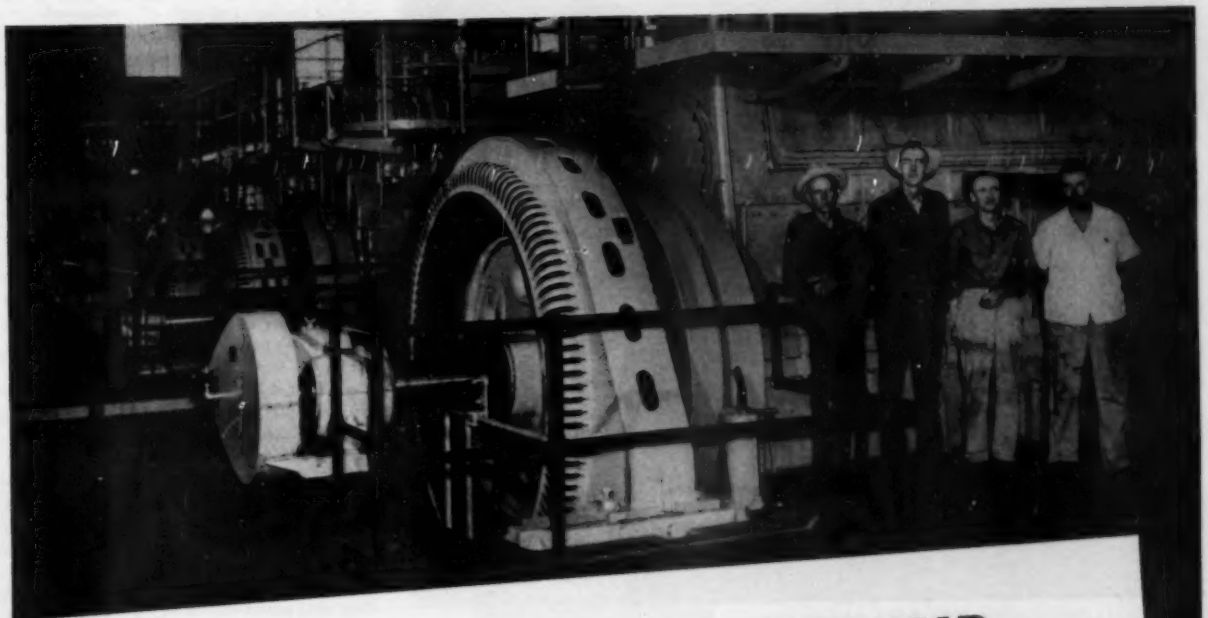
The ratcheting "C" drive and socket turn inside the head as each new "bite" is taken.

SAID to be the nearest approach to a true "universal" wrench is the open-end ratchet wrench designed, patented, and produced by the Tubing Appliance Company, better known as TAC. This one wrench with 64 socket sizes, it is claimed, will efficiently do the work of an open-end wrench, crescent wrench, box wrench, socket wrench, ratchet wrench and crowfoot wrench. It can be used with a torque handle for torque rated fittings. With sockets from 5/16-inches to 4-inches in size, the TAC open-end ratchet wrench will do practically every wrenching job, according to its makers. The secret of the wrench is the open-end, which allows the wrench head and socket to fit onto tubing and down on the fitting. When finished, the tool is lifted from the fitting, openings on the head and socket are aligned, and it is removed.

TAC reports that their tool has improved wrenching time from 50 to 500 percent. For example, on one military plane a particular hydraulic line to be connected or disconnected required other fittings to be removed. The operation took about twenty-two minutes. The TAC wrench not only reached the same fitting without removing anything, but made the disconnection in 31 seconds! The open-end ratchet wrench is not a "special" tool but a "universal" tool with more applications and efficiency than any other single wrench known, according to its manufacturers, out-performing a variety of ordinary wrenches. This is made possible by the open-end construction and the unusually strong steel alloys in the wrench. Of added help is the full hinge, square drive, removable handle; a ratchet arc as small as 5°; extra thin wall sockets; and over-all compactness in design. To increase the usefulness, adapters, quickly snapped in, allow ordinary sockets to be used with the tool. Equally handy are adapters for Allen head internal wrenching and for turnbuckle rotation. To date, most of the tools made, over 50,000, are now working for the armed forces.

A product of eight years development work during which time design after design was tested and metallurgical problems overcome, the TAC has become standard equipment with the U. S. Navy and Air Force. It was invented by Herb Fish and aided in its development by R. N. Johnson. Mr. Fish is now vice-president of TAC and Mr. Johnson is president. Currently, the company is supplying the commercial market as rapidly as materials, productive capacity and the U. S. Government will permit. For further details on the TAC open-end, ratchet wrench, write DIESEL PROGRESS, File 90, P.O. Box 8458, Cole Sta., Los Angeles 46, Calif.

NO STUCK RINGS OR CARBON, NEGLIGIBLE PISTON WEAR... *AND NO OIL CHANGE IN 14 YEARS!*



In 1937 the Municipal Light Plant, in Cushing, Okla., put Sinclair RUBILENE Heavy in service in its diesels. The oil has never been changed since! For semi-annual laboratory analyses of samples have always shown the oil to be in excellent condition.

Inspections of the diesels have revealed no stuck rings, negligible piston wear. The crankcase and upper portions of the cylinders are exceptionally clean and bright, with no signs of carbon or deposits.

This is typical of the job that *RUBILENE*® has been doing for some 40 years throughout the nation. No wonder RUBILENE is first choice of many diesel engineers and has won the endorsement of diesel manufacturers.

SINCLAIR DIESEL OILS

save wear and replacements

For more details, see your nearest Sinclair Representative, or write direct to Sinclair Refining Co., 600 Fifth Ave., New York 20, N. Y.

Purchases 83 Diesel Locomotives

The Missouri Pacific Lines has been authorized to spend $20,823,000 for the purchase of 83 diesel locomotives. Since some of the locomotives will consist of two and three power units the number of units authorized will total 126, of which 101 units will be radio equipped. The authority was granted by U. S. District Judge George H. Moore in whose court the road's reorganization plan is pending. "When the 126 units authorized are received early next year," said P. J. Neff, Mo. Pac. chief executive officer, "the railroad will have in operation about 700 diesel units enabling it to completely dieselize all trains west of St. Louis to the Colorado Rockies and South from St. Louis to Bismarck, Mo. Operations at St. Louis and Kansas City, including all yard switching will be performed by diesels." On the Gulf Coast Lines and International Great Northern Railroad, Mo. Pac. subsidiaries operating in Texas and Louisiana, Neff said, all trains south of Ft. Worth and Houston to the Mexican border will be pulled by diesel power.

Erratum

We sincerely regret that in the Table of Equipment, page 41 of the May issue pertaining to the Halliburton Cement Plant at Corpus Christi, Texas, we credited the cylinder lubricators to Manzel and the credit should properly have been given to Madison-Kipp. Our sincerest apologies.

Steam Generator Cars On T & P Railway

Interior view showing both steam generators and the diesel in the background.

The T&P Railway recently designed and placed in service its first fully automatic steam generator car which is marked as an innovation in the diesel rail transportation field. It is an important contribution to the railroads of the nation in that it solves a vexing problem facing every railroad striving to be 100-percent dieselized. The thought behind the construction of this car was to provide a flexible and mobile source of steam supply to meet the variable and unusual periods of weather in Texas, both for heating passenger and troop trains, and for emergency and standby power plant requirements over the entire system. The car is also ideally suited during the summer months to supply a large capacity of steam for the operation of steam jet air conditioning systems on passenger cars in regular passenger service and on troop trains.

The T&P have completely dieselized divisions, and like a number of other railroads, is still in the midst of its ultimate dieselization program. With the Korean War straining our facilities still more, it is difficult at times to provide these diesel passenger locomotives for each passenger and troop train for the divisions that have been completely dieselized. By utilizing this car it is possible to use freight diesel locomotives that are not equipped with steam generators, to handle passenger equipment. These cars are very versatile, they not only generate steam, but produce their own compressed air for atomizing purposes; also generate electric current for the operation of the motors on steam generators and for trainlining to various cars for lighting purposes as well as having sufficient additional capacity to operate a mechanical air conditioning system on an adjoining car, or provide lighting in case of light failure on train in which this car may be operating. The steam generator car utilizes two Vapor-Clarkson 3,500 pound steam generators, a 3-cylinder GM diesel and a Gardner-Denver air compressor.

Contracts for Harbor Tugs

U. S. Navy (Bureau of Ships) awarded an $11,539,000.00 contract to Avondale Marine Ways, Inc., for 28 - 100-ft. harbor tug boats which are to be powered each with a 1200 hp. diesel engine. These vessels, which are of steel construction, are of standard Department of Defense design and specifications and scheduled for delivery and use by the U. S. Army in various harbors of the United States. Work on these tugs will begin as soon as preliminary details are completed.

Stabilized Pressuregraph

A new Electro linear stabilized pressuregraph has been placed on the market by Electro Products Laboratories. The instrument consists of an electronic pick-up which is connected to the region where the pressure is to be studied, an associated electronic circuit and power supply, and a Du Mont type 304H- or 208-B cathode-ray oscilloscope or equivalent. It features linear outline viewed directly on the oscilloscope, drift and temperature stabilized and a wide pressure range—from .5 to 10,000 psi; frequency response from 0 to over 20,000 cps; 200,000 separate pressure measurements per second; up to 200 ft. of pick-up cable can be used. The power requirements are 60 watts at 115 volts, single phase 50/60 cycle. The unit stands 12-inches high by 7-inches wide by 17-inches deep and weighs 25 pounds. More complete information on the instrument is obtainable from the company at 4501 North Ravenswood Avenue, Chicago 40, Illinois.

Erie RR Centennial Train

The Erie Railroad, in connection with its centennial celebration, displayed what is believed to be the largest mechanical exhibit of its kind. It was a full-size cut-away "B" unit of a diesel locomotive, 51-feet long and weighing 189,000 pounds built by Electro-Motive. Coloring of passages and lines in the machinery enabled visitors to follow the movement of fuel oil, lube oil, air and water. The movement of pistons, connecting rods, valves and crankshaft was followed by visitors through an arrangement of mirrors and lights. Also included in the exhibition was a museum car containing many displays of historic and modern interest. The 18-car exhibition train toured every city and town on the Erie's 2,245 miles of rail.

Pakistan Buying Diesels

In order to end its dependence on coal, Pakistan has placed orders for 23 broad gauge diesel electric locomotives with the American Locomotive Company of New York. Similar orders have been placed with a Japanese concern for twenty-five meter gauge oil-burning locomotives. The change over is being made to free Pakistan of its dependence on India's coal.

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Cooperate to Create New Railcar

A dramatic example of transportation integration comes with the announcement from Mack Trucks, Inc., that its engineering talent is working closely with a major U. S. railroad in producing new developments in transportation. The cooperation between the railroad and the trucking company came about when the late Frederick C. Dumaine, president of the New Haven, called E. D. Bransome, president of Mack Trucks, Inc., and personally requested the building of a single-unit, lightweight diesel railcar offering passenger appeal and riding comfort. The specifications and the design of the diesel car have been drawn up in close cooperation by the engineering departments of Mack Trucks, Inc., and the New Haven Railroad. Actual work is being done at Mack's Allentown, Pa., plant. The powerplant of the new unit consists of Mack's own 220 hp. six-cylinder supercharged diesel engine, coupled directly to a 300-volt direct current generator. The propulsion equipment consists of four 55 hp. electric motors, with two mounted on each rail truck. Each motor drives a set of wheels through a propeller shaft and axle gearing. Accommodating 45 passengers in deluxe high-back seats, the car is of high tensile steel arc welded structure, with body mounted on combination coil and rubber springs. It will be equipped with the most modern appointments, including fluorescent lighting and a fully automatic thermostat-controlled heating and ventilating system.

Additional Texas Branch

A new Brownsville branch has been opened recently by Stewart & Stevenson Services. Stewart & Stevenson, distributor of GM diesel engines, serves all Texas industries with power equipment. Other branches are located in Houston, Corpus Christi, Dallas, Lubbock, McAllen and Wichita Falls.

Moves 300,000 Cubic Yards of Dirt

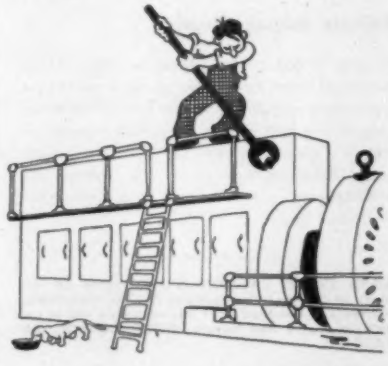
The Armco Steel Corporation expansion program called for the moving of 300,000 cubic yards of dirt at Middletown, Ohio. The McGraw Construction Company, general contractors on the job, moved 5,000 cubic yards every nine hour shift, by using two International TD-24 crawlers as push loaders, three Heiliners, one LaPlante-Choate scraper, and a TD-24 and a B-170 scraper as haul units, plus a Caterpillar D-7 and dozer to spread on the fill. Armco is adding a blast furnace, 76 coke ovens and by-products facilities to its East Works plant in Middletown, and a total of 18 miles of railroad tracks will be laid in and around the new facilities which will be operative late in 1952.

New Plant Construction

Construction of a new plant near Kansas City, Mo., for Fairbanks, Morse & Co. will be started at once by the Stone & Webster Engineering Corporation, it is announced by Robert H. Morse, Jr., president. Originally planned as a scale plant, it has now been enlarged to approximately 500,000 square feet of floor space, which includes a foundry, and is to be used to make engines and pumps. The new plant will be a one story structure and is to be constructed of brick and reinforced concrete. Including machinery and equipment, the cost is placed at $7,500,000. When in operation, it is expected there will be nearly 1,000 employees. Scale manufacturing operations of the company, now at St. Johnsbury, Vt., and Moline, Ill., will be expanded, according to Mr. Morse.

Commission New Harbor Tug

Commissioning ceremonies inaugurating service of the new Diesel-electric vessel, Esso Tug No. 10, for Esso Standard Oil Company were held recently at Pier 90, North River, New York. Stanley C. Hope, Esso president, raised the house flag on the new 105-foot vessel in the presence of Esso and General Motors officials and other guests. Equipped with a 1,000 shaft horsepower General Motors diesel engine, the ship has a speed of 13 knots and is 192 gross tons. It has a molded depth of almost 15 feet, a 25-foot beam and is designed to draw nine feet six inches forward and 11 feet aft. Designed by Tams, Inc. of New York, the tug was built by Gulfport Shipbuilding and Dry Dock Company, Port Arthur, Texas. Captain William R. Lynn of West Brighton, Staten Island, New York, is skipper.



Elected President

Robert E. Huthsteiner

Robert E. Huthsteiner was elected President of Cummins Engine Company, Inc., in Columbus, Indiana, at the recent meeting of the Board of Directors. Formerly Executive Vice President, Mr. Huthsteiner succeeds J. Irwin Miller, who becomes Chairman of the Board. Clessie L. Cummins, founder of the 33-year-old company and formerly chairman of the board, was named honorary chairman. Mr. Huthsteiner is the third president of the company which builds lightweight, highspeed, four-cycle diesel engines in the 50-550 horsepower range that are used extensively in earthmoving and mining equipment, on-highway trucks, and a variety of other heavy-duty applications. Mr. Cummins, who now resides in Palo Alto, Calif., was the first president, and when Mr. Miller was elected president in 1947, Mr. Cummins became chairman of the board.

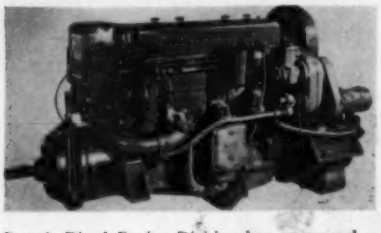
Mr. Huthsteiner has been associated with the company for almost 10 years, having come to Columbus from Chicago in March 1942 to be sales manager. He was named controller in 1944 and elected a vice president in 1946. He was elected a director for the first time in 1947 and also served successively as treasurer, general manager, and then executive vice president for the last two years.

A member of the present Munitions Board Industry Advisory Committee for Internal Combustion Engines, Mr. Huthsteiner also served on a similar advisory committee during World War II. His industry activities include active participation in the Internal Combustion Engine Institute, which he served as an officer during 1949 and 1950. Prior to his affiliation with Cummins, he was engaged for many years in sales and contracting work in connection with heavy-duty machinery. He later held various sales and management positions with Cia. Nacional de Electricidad, Torreon, Coahuila, Mexico, Pennsylvania Power and Light Company, Allentown, Pa., and Chicago Diesel Engine Division, General Motors Corporation, Chicago. He is a registered professional engineer and a graduate of the Massachusetts Institute of Technology, where he received a degree in mechanical engineering in 1925.

New Power for Municipal Plant

Grand Haven, Michigan, is in the process of enlarging its generating capacity by the installation of what is said to be one of the largest diesel generating units in the country. When all projected installations are completed, the total capacity will be about 27,000 horsepower. Engine is a Nordberg.

New Auxiliary Oil Cooler



Detroit Diesel Engine Division has announced a new auxiliary oil cooler as standard equipment for most GM diesel marine propulsion units. The new cooler affords greater flexibility of operation and longer trouble-free life for General Motors hydraulic reverse gears. The new feature enables the lubricating oil in the reverse gear to circulate through a series of plates in the engine's fresh water system thus providing a more uniform temperature in the gear box. Its use greatly extends the period of time the gear can be operated in reverse under heavy load conditions. In tests, gears were operated in reverse for periods in excess of one hour with no appreciable rise in oil temperatures. This is particularly important to tug and tow boat operators in holding or maneuvering a tow in swift currents. Another advantage is the warming action it transmits to the gear oil when the engine is first started. The water in the cylinder block warms quickly and in turn circulates about the plates warming the gear lubricating oil. This provides more positive lubrication to all vital parts of the reverse gear in the shortest possible time. The accessory is standard equipment on Series 71 three and four cylinder marine models with 3:1 ad 4.5:1 ratio reverse gears; all 6-cylinder models regardless of gear ratio and on Twin-6 and Quad-6 models for work boat installations. It is standard on all 6-110 marine units

Worthington Executives

Herman H. Miller

E. A. Murray

A. H. Borchardt

The election of Mr. A. H. Borchardt as a vice president of Worthington Pump and Machinery Corp. has been announced by Mr. H. C. Ramsey, president. in addition, the appointment of Mr. E. A. Murray as manager of the compressor division was announced by Mr. W. H. Feldman, vice president in charge of sales. Mr. Murray succeeds Mr. Herman H. Miller who has relinquished the post to act as consultant to Mr. Murray. Mr. Miller plans to retire at the end of this year.

Mr. Borchardt will have overall responsibility for the sale of the corporation's entire line of pumping equipment, including centrifugal, reciprocating and vertical turbine pumps. A past president of the Hydraulic Institute, Mr. Borchardt is also a member of the American Society of Mechanical Engineers, Technical Association Pulp and Paper Industry, American Petroleum Institute, Manufacturers' Club of West Hudson, N.J. and the Montclair, N.J. Society of Engineers.

Distributors Named

Hoover Equipment Co., with headquarters at Oklahoma City, Oklahoma and McCormick Machinery Co., with headquarters at Tulsa, Oklahoma have been named Caterpillar Tractor Co. distributors, it is announced by J. J. Valentine, Assistant Director of Sales. R. L. Hoover is president and general manager of the former organization, James T. Hoover, vice-president and assistant manager and Blanton W. Hoover, secretary-treasurer. Heading McCormick Machinery Co. as president and general manager is W. F. McCormick. John W. Neilson vice president and sales manager.

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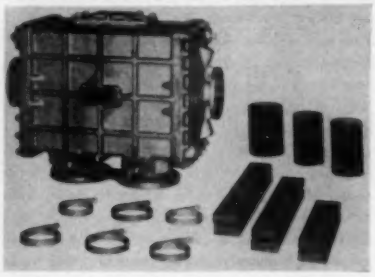
GE Announces New Modernization Kit



An oblique top view of the General Electric Company's new engine cooler modernization kit, designed to replace the present air-cooled engine cooling system on G-E 70 ton diesel electric locomotives not equipped with dynamic braking.

A complete kit for modernizing the cooling system of diesel electric locomotives not equipped with dynamic braking has been announced by the General Electric Company's Locomotive and Car Equipment division. The kit includes the new water-type engine oil cooler system, complete with oil cooler supports, oil and water hoses, hose clamps and installation drawing. The new engine oil cooler has been designed to replace the present air-cooled engine cooling system. According to G-E engineers, the sturdily constructed G-E cooler is reinforced with well-proportioned ribs, furnishes better year-round temperature control, requires less maintenance costs, saves on lube-oil life and brings faster warm-up time for the locomotives using it. Easy to install, the cooler system can be mounted on the floor of the air chamber in front of the engine's water radiator. A simple piping arrangement connects the new oil cooler into the engine's cooling system. The new cooler does not require moving parts.

Suspends Commercial Diesel Sales

Major changes in operating policy, involving a conversion to defense work and suspension of commercial diesel engine sales, were announced by ABOE, Inc., New York, American branch of the Brush-Aboe Group of Associated Companies, London, England. Bosworth E. Monck, executive vice president of the company, in announcing the move, explained that the new policy, which takes effect at once, is designed to create a flexible operating setup that should greatly facilitate plans now under way for contributing to the joint American-British defense program. "While I am not at liberty to discuss details of these new plans," he said, "I can say that their character is such as to compel radical changes in our operating policy."

Although it had been hoped earlier to operate the new defense program while at the time continuing the commercial diesel sales effort, it had been found impossible to do so because of growing consumer production difficulties, Mr. Monck said. Stocks of spare parts warehoused in this country, he added, were believed to be amply adequate for handling needs of the foreseeable future, and would be maintained. In addition, he reported, David Mansell, chief engineer, and Tom Love, service manager, will remain here for advice and assistance on all diesel service matters generally. In cases of emergency, the Vivian Diesel Works, Ltd., Vancouver, B.C., acquired last year by the parent company, and equipped with complete drawings and specifications, would be in a position to fill any gaps.

Fram Promotions

Howard E. Robinson, general sales manager of Fram Corporation for the past several years, has been elected vice president in charge of sales, according to information released by Steven B. Wilson, Fram's president and board chairman. Mr. Robinson will have responsibility for all sales divisions of the corporation. Milton M. Somers, sales manager of the automotive jobber division for the past several years, has been promoted to general sales manager. Arthur F. Pettet, general manager for the past two and one-half years, has been elected vice-president and general manager of the company. Ralph W. Hazlehurst has been promoted from his position of traveling auditor to assistant treasurer, filling the vacancy created by the resignation of T. Edward Algham from that position. Mr. Algham remains as vice president in charge of purchasing, and secretary of the corporation. In addition, the following promotions have also been announced: David C. Muell, formerly general production manager, was appointed manager of the Orrtex division of the corporation. Mr. Buell's former position will be filled by Vernon A. Johnson, who was assistant production manager, and who will be the acting production manager.

Research Metallurgist

Thomas E. Eagan

The promotion of Thomas E. Eagan to a new position of research metallurgist has been announced by Ralph L. Boyer, vice president and chief engineer of The Cooper-Bessemer Corporation. "The new post of research metallurgist," explains Mr. Boyer, "is another important step in Cooper-Bessemer's continuing program of intensive development work in the design and manufacture of engines and compressors. In his new post, Mr. Eagan will direct his full energies to furthering Cooper-Bessemer's experience in the field of nodular iron and other engineering metals for its own production needs," continues Mr. Boyer. Cooper-Bessemer's pioneering work in the practical application of nodular iron to foundry procedures under the supervision of Mr. Eagan has received widespread attention of metallurgists throughout the world. The first large engine and compressor builder licensed to produce nodular iron, Cooper-Bessemer has already perfected several important developments in the use of this newest material for engine and compressor components subject to high tensile stresses and where cast steels or forgings were formerly essential.

A national director of the American Foundrymen's Society, Mr. Eagan is also a member of the American Society for Metals, the British Iron and Steel Institute and the American Society of Corrosion Engineers. He is chairman of the subcommittee on Specifications for Nodular Iron of the American Society for Testing Materials and is on the Iron and Steel Committee of the Society of Automotive Engineers. In addition he is a member of the American Institute of Mining and Metallurgical Engineers. Mr. Eagan's former laboratory supervision now becomes the responsibility of W. R. McCracken who as a thoroughly trained metallurgist with many years of experience, will be in charge of Cooper-Bessemer's foundry research laboratories in Grove City, Pennsylvania. Mr. McCracken will also supervise the materials control of Cooper-Bessemer foundry operations in both its Mount Vernon, Ohio, and Grove City, Pennsylvania plants.

Deceased

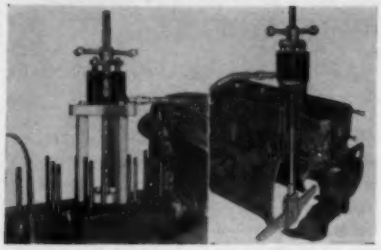
Frank G. Oberle, divisional sales manager for the American Bosch Corporation, died suddenly at his home in Chicago July 16, 1951. Although only 44 years of age, Mr. Oberle had been associated with American Bosch since 1925 and had been manager of the Chicago office for six years, having previously held similar positions in New York and Cleveland. Well known throughout the internal combustion industry, he was a member of the American Bosch 25-Year Club, of the Illinois Athletic Club, and of the Society of Automotive Engineers.

More Foreign Steel and Aluminum Purchased

For the second time in seven months, Cummins Engine Company, Inc., at Columbus, Indiana, sent representatives to Europe to purchase steel and aluminum needed to maintain the current high levels at which Cummins Diesels are being produced. Two Cummins representatives, H. H. Lurie, the Company's chief metallurgist, and J. A. Beaman from the purchasing department, have left on their flying trip to Belgium, Germany, Luxemburg, Norway, and England. They plan to visit and inspect steel and aluminum making facilities in each of the five countries and place orders for various types of high quality steel and aluminum.

When announcing this second buying trip to Europe, R. E. Huthsteiner, President, explained that European steel and aluminum is being sought because domestic sources indicate that they will not be able to supply all of Cummins' expected requirements. He said that the demand for the Company's products is still increasing and that, therefore, even though plant capacity has been increased more than 60 per cent since World War II, the Company now has under way another $6,000,000, two-year expansion program which will increase production activity at least another 50 per cent. A similar steel buying expedition late last year by Lurie and K. S. Shaw, Cummins' supervisor of purchasing, assisted the Company in maintaining continuously increasing production schedules. Cummins officials said that the quality of European steel used to date has been satisfactory and delivery promises have been kept by European mills.

New Hydraulic Puller



Removing sleeve. Installing sleeve.

Owatonna Tool Company announces a special sleeve pulling and installing set as part of its Power-Twin Hydraulic Pulling Systems. Said to be the handiest, most versatile system yet devised, the set will pull and install cylinder liners on more than 200 different makes and models of trucks, tractors and power units. For this new set, sleeve jobs which once took hours now are completed in minutes. The OTC Power-Twin Sleeve Puller is adjustable to center perfectly over the bore and to provide clearance over cylinder head studs. It removes and installs sleeves from 3" to 6" without damage or distortion. Present OTC Sleeve Pullers may be adapted to the Power-Twin Hydraulic Unit by adding only a few parts. See your jobber or write Owatonna Tool Co., 415 Cedar Street, Owatonna, Minnesota, for Catalog 97-A.

New Sales Agency

W. C. Gould

A new sales agency for the distribution of General Motors Series 71 and 6-110 marine diesel engines has been established in the General Motors Building, 1775 Broadway, New York City, by Detroit Diesel Engine Division, manufacturer of 2-cycle diesel engines for pleasure craft, fishing boats and work boats. The sales agency is under the supervision of W. C. Gould, who has been marine sales manager at Detroit Diesel since May 1945. Mr. Gould came to Detroit Diesel from the Allison Division of General Motors and has been with General Motors Corporation since July 1941. He is a mechanical engineering graduate of Lafayette College, with wide experience in the aircraft and marine engine fields. The new GM diesel marine sales agency will serve an area including lower New York State (south of Schenectady), southeastern Connecticut (south of New London) and eastern New Jersey. Detroit Diesel has three marine dealers in this area: West Haven Shipyard, Inc., of West Haven, Conn.; Henry Knese Marine Sales & Service, Inc., Flushing, N. Y.; Diesel Engineering and Equipment Co., Inc., Perth Amboy, N. J. The new sales agency will serve as the distributor of engines and parts to these dealers but will not in itself stock parts or offer engine maintenance and repair service. Owners of GM diesel engines in this area will procure parts and service from the dealers.

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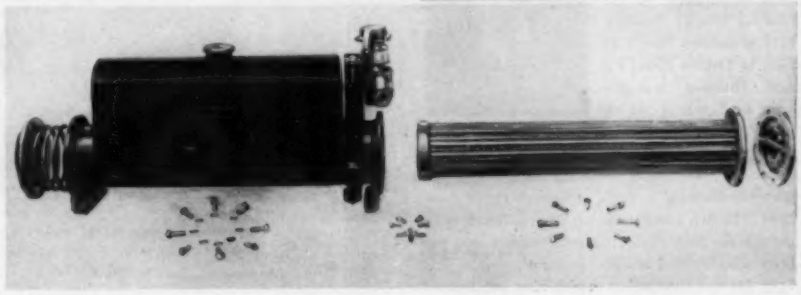
COMPACT HEAT EXCHANGER

A FINE example of a heat exchanger made for use on boats, compactly built and designed for trouble-free operation, is the Wixkuler, manufactured by Wix Cooler Company of Seattle 8, Washington. This unit is capable of providing heat for cabins and hot water for the galley. It combines temperature control, expansion tank, cooling unit and reservoir in one package which is mounted inboard on the craft. This obviates the need to drydock in order to clean or inspect the unit. Construction makes for long life. The manifolds and tube-sheets are of a special bronze alloy. The shell housing is made of high strength Monel metal. Copper alloy tubes are mechanically forged into the tube-sheets, assuring tight joints and no leakage. All seams are double welded without any soldered or sweat joints being used. It is equipped with a standard automotive thermostat of the by-pass type. This type of thermostat is used to provide rapid engine warm-up while providing full flow of water through the engine jacket during the warm-up period. The thermostat is easily removable without breaking any pipe or hose connection. They come in two temperature ranges; the "standard," which maintains temperature between 160° and 180° F.; and the "high temperature," which maintains it between 170° and 190° F. A galvanic retarder is provided which eliminates electrolytic action of sea water. There is no need to install electrolytic traps or zinc pots. Heavy wall thickness tubes are straight which makes for easier cleaning inside and out.

The "high temperature" thermostat is generally preferred when a standard automotive hot water heater is attached for cabin heating. Hot water for the galley is supplied by connecting with the Wix Galley Maid. The Galley Maid can be used on direct salt water systems with the use of a galvanic protector plug. This storage type water heater has a non-rusting Monel metal interior, removable "U" copper coils and Feltrok or Fiberglas insulation all around. All fittings are on one side, making for easy installation.

The Wix Galley Maid storage-type hot water heater. All fittings are on one side for easy installation.



Exploded view of the Wixkuler unit which is made in six sizes for engines up to 200 hp. Larger units are made to order.

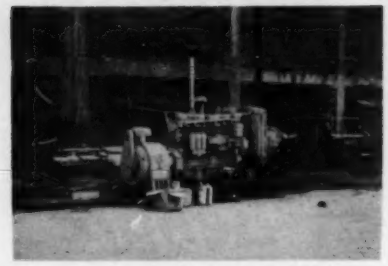
Starts Delivery of Radial Diesels

Ready for shipment by flatcar to Chalmette, Louisiana, site of Kaiser Aluminum and Chemical Corporation's new aluminum reduction plant, is this 1820 hp. Nordberg gas burning radial engine, first of 80 similar power generating units being built for this plant by Nordberg Manufacturing Company, Milwaukee 7, Wisconsin. The Nordberg radial engines are of the two-cycle type, each having eleven cylinders of 14-in. bore and 16-in. stroke. The engines develop their rated horsepower at 400 rpm. and will drive 1290 kw. direct current generators. They are gas burning and spark fired. Cylinders of the Nordberg Radial engine are equally spaced radially about a vertical shaft and are located in a horizontal plane. The firing order is consecutive around the circle. Perfect balance is achieved by actual convergence of combustion pressures and inertia forces at one focal point on the crankshaft axis. The compact cylinder arrangement not only reduces engine room floor space to one-half the usual requirements, but also permits the engine to be transported as a complete unit from the factory to the site of installation. Because of its balanced operation, the engine requires only a simple, inexpensive foundation.

Self Propelled Diesel RR Car

Operation of a streamlined, self-propelled Diesel-electric car on short trips in and out of Buffalo is being considered by the New York Central. It was reported that the Central may begin running these one-car, engineless trains between Buffalo, North Tonawanda and Niagara Falls in September. There also were reports that the Central is looking into the possibilities of operating one of the 60-mile-an-hour Diesel cars between Buffalo, Rochester and Syracuse. Under one plan being discussed, the 90-passenger car would make two round trips a day, stopping at the Terrace Station in downtown Buffalo.

Diesels Aid Kansas City Recovery



A Caterpillar D13000 electric set provides emergency power for an industrial plant in the stricken Kansas City area.

The tremendous clean-up task in the wake of the flooding Missouri River is now underway in the Kansas City and Topeka areas. Emergency work is being rushed to open mud-clogged streets, haul away tons of debris and to repair water and sewer systems. To help in the disaster, Caterpillar Tractor Co. rushed eighteen diesel tractors equipped with Traxcavators and bulldozers to the rescue. Martin Tractor Co., Topeka, supplied a substantial number of machines to a local organization, Disaster, Inc. This unit was quickly organized among contractors to allocate clean-up work areas on an efficient basis. In Kansas City, Kansas, Hobson and Company supplied heavy machines to local groups clearing the community of mud and debris. More equipment, already in the stricken area, such as diesel electric sets, have been put to use providing emergency light and power in heavy industries.

Ralph L. Boyer Wins Lamme Medal

Ralph L. Boyer

Ralph L. Boyer, Vice-President and Chief Engineer of The Cooper-Bessemer Corporation, Mount Vernon, Ohio, has been awarded the Lamme Medal, one of Ohio University's highest honors. The 1951 awarding of the Lamme Medal was made to Mr. Boyer for the development of today's important gas-diesel engine and the high compression spark-ignited gas engine. The annual conferring of this highly coveted medal fo rmeritorious achievement in engineering is a result of an endowment to Ohio State University by Banjamin G. Lamme, former Chief Engineer of the Westinghouse Corporation who initiated practically all design calculations that go into the construction of generators and motors. Mr. Boyer is the twenty-fourth Ohio State graduate so honored from over ten thousand Ohio State engineering graduates since 1892.

Purchases Buses

Orange & Black Lines, Inc., of Fairview, N.J. recently purchased five Model C-45, 45-passenger Mack buses powered by Mack's ENDS672 supercharged 220-horsepower diesel engine. Built to conform with ICC specifications, these buses are completely equipped for suburban operation and include such features as all forward-facing, high-back deluxe seats, interior baggage racks and individual reading lights. The interior ceiling and side panels are of Formica in a color to harmonize with the seat upholstery. Sash is the horizontal sliding type, providing maximum visibility and ventilation.

Elected Charter President

B. T. Eagerton

Mr. B. T. Eagerton, Vice President, Export Division, Nordberg Manufacturing Company was elected charter president of the Milwaukee Trade Club, Inc. Announcement was made at an annual World Trade Dinner in Milwaukee. Mr. Eagerton is also vice-chairman of the Foreign Commerce Commission of the Milwaukee Chamber of Commerce. He has been in charge of the Export Sales Division of Nordberg Manufacturing Company since 1946 and recently returned to Milwaukee from an extensive trip through Mexico and Central and South America. Milwaukee Trade Club, Inc. was formed through the amalgamation of two former Milwaukee export associations. Mr. Eagerton had been active in both organizations.

New Dealership Formed

Cummins diesels are now being sold and serviced in Connecticut by Cummins Diesel Engines of Connecticut, Inc., formerly Cummins Diesel Engines of New England, Inc., with headquarters at 37 Airport Road, Hartford, Connecticut. When announcing the formation of the Connecticut dealership, L. W. Beck, vice president-sales of Cummins Engine Company, Inc., at Columbus, Indiana, pointed out there is no change in dealership management or personnel. J. A. Mango, known widely as the Cummins dealer in New England for the last 15 years, remains as president of the Connecticut organization. Only the name of the company has been changed, and no interruption in sales and service coverage to Cummins users is anticipated. The Hardford shop has long been equipped to completely overhaul and rebuild Cummins diesels. Nevertheless, Mr. Mango reports plans for increasing the service facilities by adding 7,500 square feet to the shop area, additional tools and equipment. A complete stock of Cummins-warranted parts also is available at Hartford. The service and sales of Cummins diesels for the states of Maine, New Hampshire, Vermont, Massachusetts, and Rhode Island will be handled by Cummins Diesel of New England, Inc., 201-09 Cambridge Street, Boston, (Allston), Massachusetts.

Inland River Reports

By DAVID I. DAY

WE OBSERVED recently the M. V. *Sohio State* enroute up the Ohio from Mt. Vernon, Ind., to Tiltonsville, O., with several barges of gasoline. Capt. Ernest Pinkerman was in command with Capt. Guy M. Eaton in the pilot house. Originally this boat was called the *Edgar C. Johnston* with Houston, Tex., as home port. She is a 1300-hp. pusher powered by twin National Superiors.

THE SMART new 84-ft. *Kishwaukee* from the yards of J. L. Bludworth, Houston, Tex., is now doing fine work for her owners, the Smith Oil Refining Co., Rockford, Ill. We saw her on her third trip up the Mississippi from Helena, Ark., headed later 222 miles up the Illinois River to Peru. The boat is a single-screw craft with General Motors (Cleveland) diesel engine rated at 1600 hp.

WE HAVE FROM L. J. Powers, Pittsburgh, a snapshot of the M. V. *John J. Hoopes,* a sternwheeler in the Earl Webster fleet. The boat is powered by twin Caterpillars with a total of 400 hp. The boat was originally built at the yards of the Dubuque Boat & Boiler Co., Dubuque, Iowa. The picture was taken as the *Hoopes* pushed three barges of coal 70 miles to Pittsburgh. It is said to be the first coal ever shipped to that city from East Brady, the head of slackwater on the Allegheny.

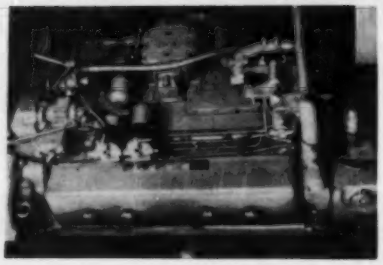
THE STERNWHEEL *Benwood* of the Zubik Towing Co., Pittsburgh, Pa., is out at work with twin Buda diesels totaling 560 hp. This 125-ft. boat was built by Dravo in 1927 and was formerly the property of Wheeling Steel Corporation.

PASSING PADUCAH recently was the new M. V. *Mt. Vernon* of the American Barge Line, Louisville, her Cooper-Bessemer engines easily handling upstream a tow of 115,000 barrels of petroleum products. This towboat was built last spring by the Jeffersonville Boat & Machine Co., Jeffersonville, Ind.

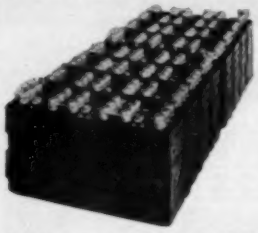
A MOST UNUSUAL sight was observed at the Keokuk, Iowa, Dam on the Mississippi when three identical towboats of the Commercial Petroleum & Transport Company fleet were locked through one after the other. The boats were the *Davy Crockett,* the *Sam Houston,* and the *Stephen Foster.* Each was pushing around 5000 tons of oil products. Each is powered by single Enterprise diesels, each 1500 hp.

A NICE SIGHT one recent early morning was the *Frank C. Rand* of the Mississippi Valley Barge Line, St. Louis. The *Rand* is powered by National Superiors, 2000 hp. Dravo-built, the boat has been a real "workhorse" the last four years.

ONLY A FEW times this summer have we encountered the game little tug *Roland,* at last accounts a George Bacon boat with Houston, Tex., as home port. We saw her in late July swiftly moving up the Ohio with a couple of barges of gasoline. She is a fine ad for the Enterprise diesel engine people.



Recently added to the fleet of the Minneapolis Dredging Company of Minneapolis, Minnesota was the *Meander*, a 47-ft. 8-in. tow boat built by Barbour Metal Boat Works of St. Louis County, Missouri. The craft is one of the first work boats on inland waters to be powered by General Motors' new 6-110 diesel engines. Two of these engines driving twin screws 42-in. by 32-in. give the *Meander* a pushing capacity of 1200 tons. Each engine is equipped with General Motors hydraulic reverse and reduction gears in 3:1 ratio. The boat will be used as a dredge tender in addition to towing.



West Coast Diesel News

By FRED M. BURT

RE-POWERED with an 8-cyl. 240-hp. 900-rpm,. Buda diesel, driving through a 2:1 Western marine gear was the American Fisheries, Inc. (Bellingham, Wash.) 85-ft. cannery tender *Glenwood*. A Gardner-Denver air motor is used to start the diesel.

FROM ANDERSON-O'BRIEN CO., Los Angeles, General Motors dealers, two 33-kw. generating sets with 3-cyl. 50-hp. G.M. diesels, for the U. S. General Services Administration, to be sent to Indo-China for power and lighting.

SAN PEDRO albacore boats out of San Pedro equipped with Petter diesel auxiliaries, *Elsie Fay* (Model AV1), *Victoria* (Model AV2) sold and installed by Shepherd Diesel Marine, San Pedro.

AMONG NEW engines serviced by Cummins Service & Sales, Los Angeles—five 200-hp. (NHB) Cummins diesels in Mack trucks for West Coast Fast Freight lines, Los Angeles; also three of same for Empire Transportation Co., Los Angeles, and two for Asbury Transportation Co., also in Macks.

BUILT AT Puerto Penasco, Gulf of California, to fish for Pesquera E Industrializadora de Guyamas, the *Carlos Castillo Breton*, 62-ft. wood shrimp trawler, powered with a 120-hp. Caterpillar marine diesel, driving through 3:1 Twin Disc reduction gear.

THE PURSE SEINER *Victoria*, (skipper-owner Johnny Zankich) has been re-powered with an 8-cyl. 365-hp. 750-rpm. Atlas Imperial diesel engine sold by National Supply Co., Terminal Island; also equipped with a 2:1 Model 120 Western marine and reduction gear.

SUPPLIED BY Kenneth-Frazier Co., Los Angeles, to the University of Calif. at Los Angeles, (UCLA) a model 318, 80-hp. Caterpillar diesel direct-connected to a 60-kw., 1800-rpm. Electric Machinery generator, equipped with a Synchro-Start automatic starting system; used for standby power unit in new boiler plant.

UNDER CONSTRUCTION at Sterling Shipyards, Vancouver, B.C., a 74-ft. seiner-packer for Johnny Dale of Canadian Fishing Co., power plant a 270-hp. Caterpillar diesel; also converted at the same yard, 110-ft. *Cape Pine*, for the same company, an ex-subchaser, U. S. Navy—power from 12-cyl. 320-hp. Caterpillar diesel.

FOR BISCAILUZ CENTER in Southeastern Los Angeles, an underground defense facility, storage, and civil water supply; a standby electric set—a 6-cyl. 180-hp. Buda diesel hooked to a 75-kw. Kurz-Root generator.

NEW STERLING TRUCKS powered with 200-hp. Cummins diesels, two for Merrifield Trucking Co., Anaheim, Calif., two for Consolidated Coppersstate Lines, Los Angeles; also three Diamond T's with 175-hp. Cummins diesels for Harry Williams, South Gate.

AFTER OUTSTANDING satisfactory tests including two years service in the heaviest towing work, Model P6, 540-hp., 600-rpm. supercharged Union diesel engines are now broadly offered; recently sold for installation, two of these engines for a new steel tug, Jackson Towing Co., Angeleton, Tex., and for re-powering fishing packer (ex-YMS), B.C. Packers, Ltd., Vancouver, B.C.

FOR THE Utah Construction Co. for use in large volume earth-moving at a dam at Jackson, Calif., four new, single engine, Euclid scrapers, powered with 400-hp. Cummins diesel engines.

PURCHASED FROM Thomas A. Short Co., San Francisco, 60-kw. Caterpillar diesel electric set for the *Black Douglas*, U. S. Fish & Wildlife Service research vessel.

FROM BUDA ENGINE & EQUIP. CO., Los Angeles, for the Seal Beach, Calif. sewage disposal plant, two 18-hp., natural gas-sludge gas Buda engines to power Fairbanks-Morse, horizontal, bladeless pumps, 800-gpm. with 38-ft. head at 1750-rpm.

FOR SKAGIT STEEL & IRON CO. (near Seattle) to power two new yarders being built for logging operations in Northern Washington, two 12-cyl. 400-hp. Cummins diesel engines.

IN THE SAN DIEGO albacore boat *Atka*, (Skipper Robt. Ruiz), an interesting installation of a 1-cyl. 5-hp. Petter diesel, to operate the refrigeration system, has the refrigeration compressor on a steel frame above the engine, in a plywood housing on the after deck, for easy servicing and to leave more space below for carrying fish.

FROM THOMAS A. SHORT CO., San Francisco, for 65-ft. tug *Molly*, San Francisco Bridge Co., a 400-hp. Caterpillar diesel with Falk 3½:1 reverse and reduction gear; Maxim engine silencer; installation at Sausalito (Calif.) Shipbuilding Co. yard.

DIESEL ENGINE CATALOG has just come off the press in its Sixteenth expanded Edition. Completely revised and re-edited, it is an invaluable aid to design engineers and buyers. ORDER COUPON ON PAGE 22.

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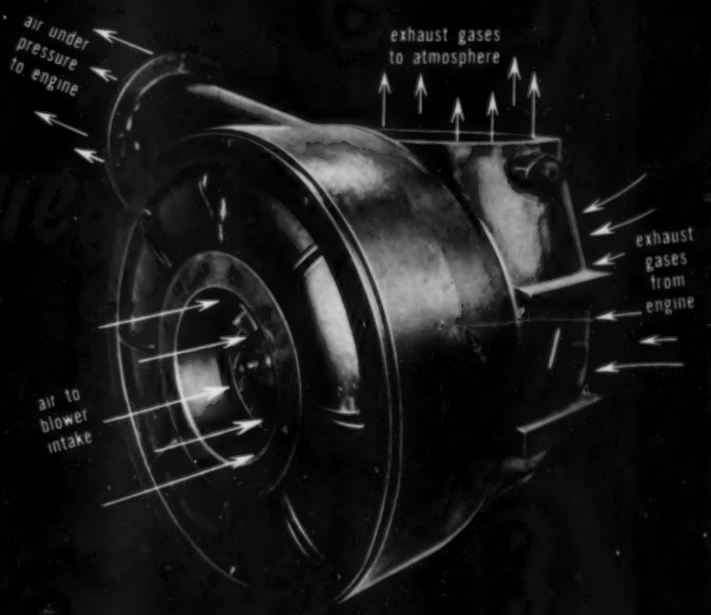

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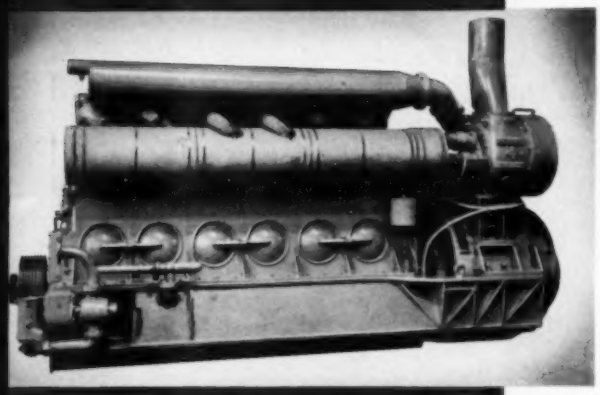

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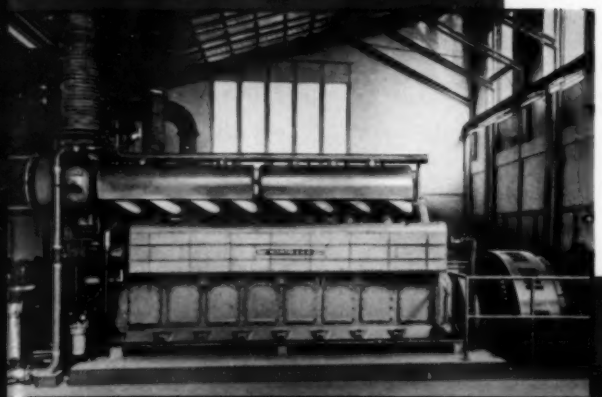

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